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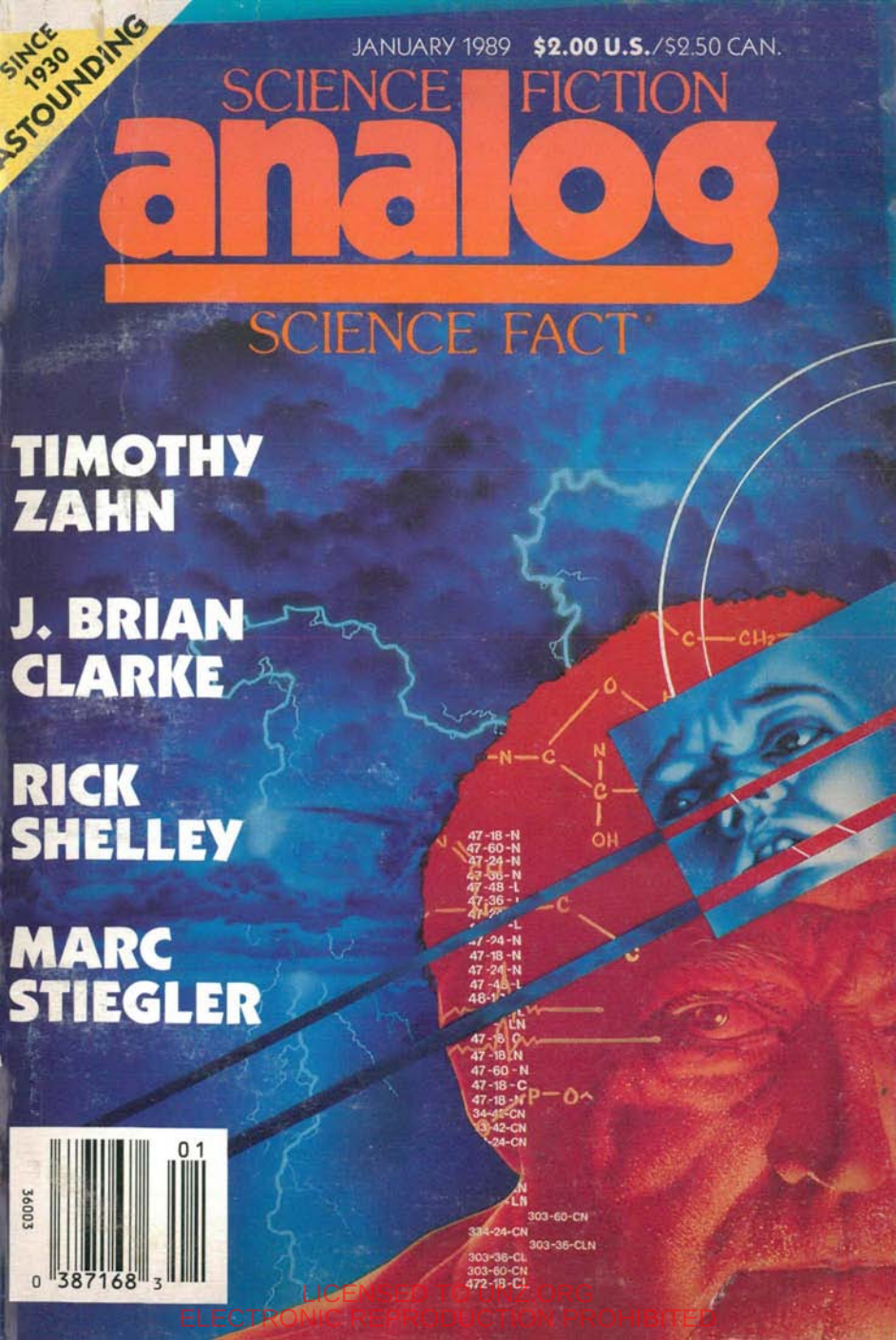

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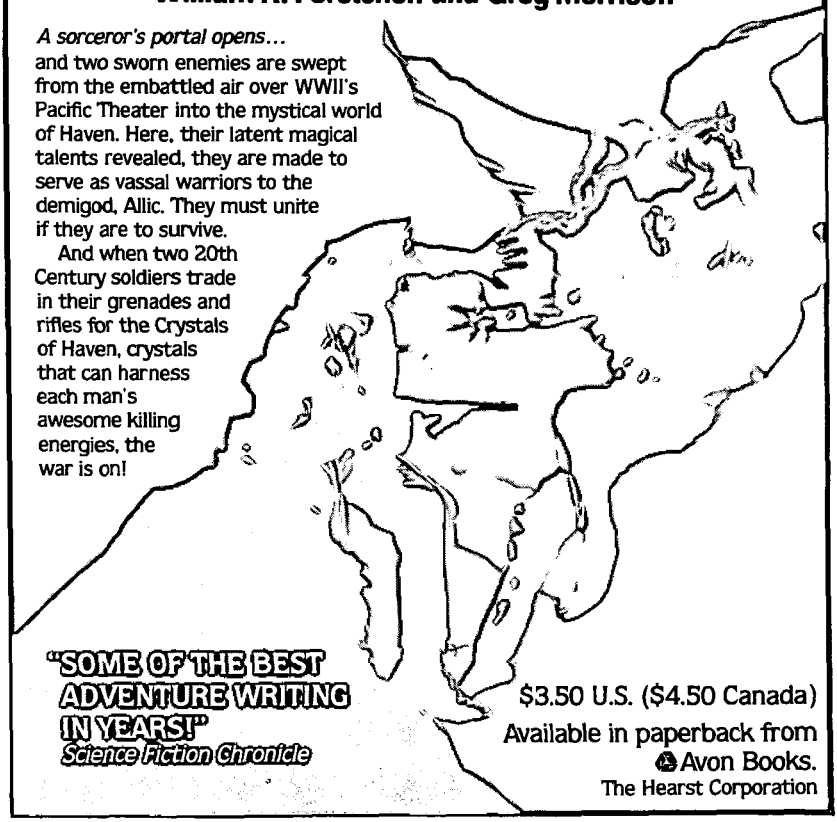

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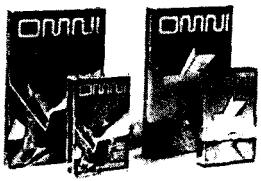

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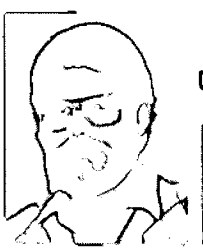

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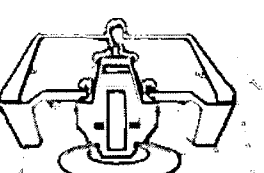

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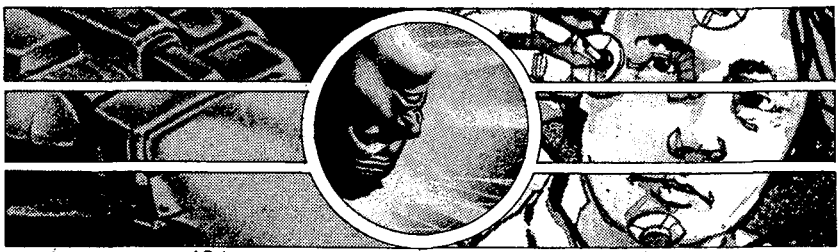

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Editorial

TRAINING MISSION

Stanley Schmidt

One of the highlights of the 1988 Nebula Awards Banquet, in Hollywood, was a talk by Dr. Louis Friedman (with a brief but remarkably eloquent introduction by Dr. David Webb) on the prospects for human exploration of Mars. Last year, in a guest editorial here, Ben Bova cautioned against the dangers of promoting expeditions to Mars as an *immediate* goal with such zeal that it might endanger the whole space program. But whether you view going to Mars as something to be done *now* or something to be done *later*, you probably agree that it's something we can and should do *eventually*.

But who are "we"?

While I was listening to Louis Friedman's talk in California, a good portion of which was devoted to the possible benefits of a joint international expedition to Mars, it occurred to me that, in the long run, the biggest benefit of that kind of mission might be one that has received relatively little mention in the ongoing debates over this subject. Going to Mars, no matter who does it, is going to be a big, difficult venture—but not as big and difficult as some other things that are going to *have* to be done eventually. And those things will, by their very nature, have to involve international cooperation.

The scientific harvests to be reaped from a Martian expedition are fairly obvious and widely known. A common argument for making such a trip a cooperative undertaking by two or more nations is that the difficulties are so big that they can be overcome most economically by having several groups pool their material resources, knowledge, and skills, so that the weaknesses of one group can be offset by the strengths of others. I can see a certain merit in this

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argument, especially in the short term. But in the long term, the biggest reason for several nations to go to Mars together may not be that it's so *hard*, but that it's so *easy*.

Consider some of the other truly global problems that are also looming ahead of us. Sooner or later we are going to have to learn to get along with our environment, balancing uses against abuses, costs against benefits, and so forth—and by "us," I mean all of us. Climate and ecology do not recognize political borders. It would be simpler for everybody if what I did in my yard was nobody's concern but mine and what you did in yours was nobody's concern but yours. Sometimes that's true, but unfortunately the world doesn't always work that way. When my neighbors were having a tree removed, I had to insist on certain changes in the way their work crew did its job—because they were dropping chunks of their tree in my freshly planted garden. The next time anyone wants to drill a new well in the neighborhood, I will have to think very seriously about filing an objection with the planning board, because the local aquifer seems to be nearing its limits—and those limits are subject to change. That sort of problem can easily extend far beyond a neighborhood, as in Ben Bova's story "Water Rite" (published here in March 1988); and when it does, nations may well be forced to cooperate or fight.

In the past, of course, the choice has often been to fight. In the future, that choice will be less and less acceptable—which leads us to perhaps the clearest and most dramatic example of a problem which is going to require international cooperation. Not everyone has yet seen far enough to recognize that fact, though most people who have given the matter any thought at all recognize that *something* has to be done about the relatively new possibility of mutual annihilation by nuclear (or biological, or nanotechnological) weapons. Some still cling to the belief that the way to prevent destruction by large-scale weaponry is to own even larger-scale weaponry that will make "the enemy" afraid to use his. More recently, we've been hearing a lot about purely *defensive* armaments such as space-based antimissile systems. These, if workable, seem more palatable because the weapons involved can be used *only* against missiles and not directly against people or their homes—or so we are told. It may even be true, for a while, if the systems are properly designed and deployed.

For some of us, though, even the best imaginable such system seem like no more than a bigger and better stopgap. It may indeed be possible to make a space-based antimissile system that will quite thoroughly wipe out all existing kinds of missiles and nothing else. But *existing* kinds of missiles are not the only ones we have to worry about. If such a system is built, it may provide safe, impenetrable defense—until the Other Side figures out a new kind of offensive weapon that circumvents the defenses. History strongly suggests that as long as there is an Other Side who strongly *wants* to get through any given

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defensive system, it will eventually find a way to do so. Moreover, human beings have shown a remarkable capability for taking something designed for only one purpose and adapting it to completely different purposes—up to and including offensive use of "purely defensive" weapons.

So, valuable as "a good roof" might be for eliminating the threat of nuclear or nanotech war in the short run, defensive hardware alone is no more a long-term solution than the Maginot Line was. A true long-term solution will involve big, widespread changes in how people *think* about solving international problems. The only (politically) safe world is one in which there *isn't* an Other Side who wants and feels free to take what it wants by violence. Skeptics object that achieving such a state amounts to "changing human nature," which

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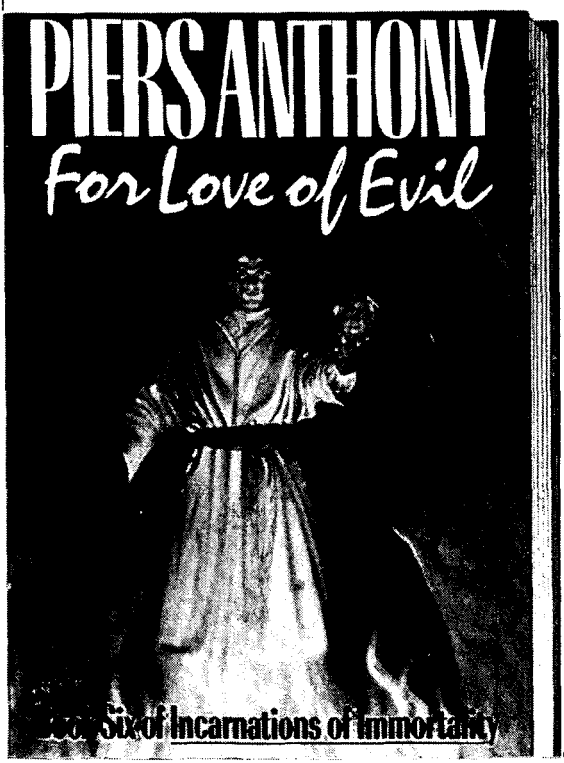
The Incarnations of Immortality series continues!

PIERS ANTHONY

Book Six of the Incarnations of Immortality series features the Incarnation of Evil himself: Satan.



Once again, Piers Anthony delivers an allegorical feast, as he weaves the life of Satan into the complex tapestry of the earlier volumes—showing how Satan struck his pact with Gabriel, how he happened upon Orb, the daughter of Niobe, and matched his voice with hers.

William Morrow

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they consider intrinsically impossible. Nevertheless, it (or a remarkable imitation) has been done before—the transition from hunting and gathering to agriculture is but one example that springs readily to mind—and it will probably have to be done again. An absolutely universal change in human nature does not seem likely, especially in a short time, but it may not be necessary to go quite that far to achieve something useful. Social inventions can have similar effects—for example, a cooperative effort among governments could *compel* appropriate behavior while waiting for it to become automatic. Widespread use of something like the Zetetic institute in Marc Stiegler's novel *David's Sling*, could radically alter the way individual citizens think and what they will tolerate from their governments. Cooperation *among* governments, along the lines suggested in Ben Bova's book *Assured Survival*, could make space-based defenses far more protective of far more people, for longer, than the same hardware used unilaterally by a single government.

That kind of cooperation seems a bit beyond what many, if any, governments are prepared to undertake—now. But that can change. It *has* to change, and occasionally one even sees a faint glimmer of awareness of that fact in people directly involved in government. Eventually, if humanity is to find anything resembling a long-term solution to this survival problem—and if it doesn't, other problems will have little significance—individuals *and nations* will have to learn to work together in ways they have never done before. Eliminating the military threat touches both individual and national lives in such profound ways that figuring out a cooperative solution is going to be a huge, complex problem. Beside it, a joint expedition to Mars seems small and simple.

Which is just what you want for a training exercise: something which applies, on a relatively small and manageable scale, principles which you will later have to apply to bigger and harder problems. Both hardware requirements and the emotional issues involved in a joint scientific venture are small compared to those of working out a system of hardware and political control to protect this planet's entire population from its more belligerent elements. But the principles, the kinds of things people and governments must learn to do to work together, may not be all that different.

So it might well be worthwhile for several countries to go to Mars together—not just so they can do better science cheaper, but for the practice at cooperation *per se*. Let's do something *pretty* big and hard together, not just for its own sake, but to learn *how* to do big, hard things together.

So we can do it on something *really* big and hard when we have to—because that time is not far off. ■

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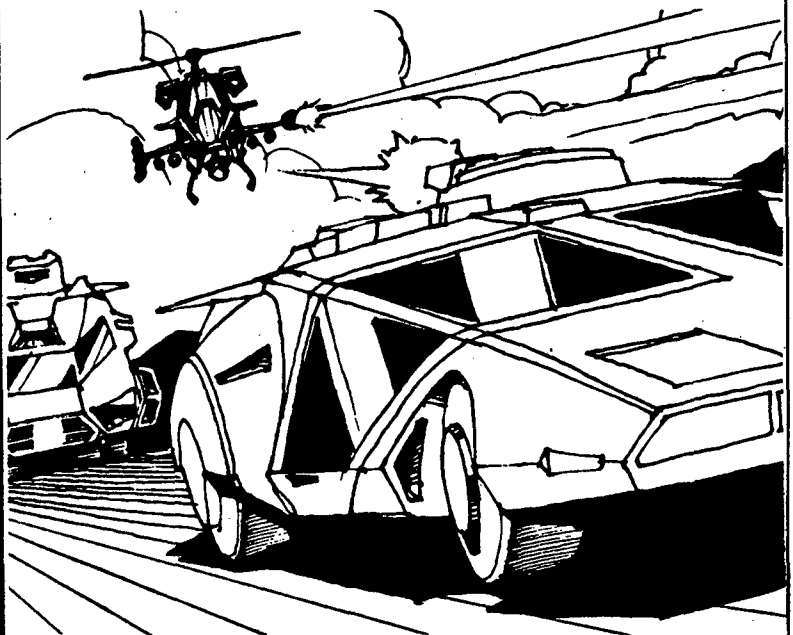

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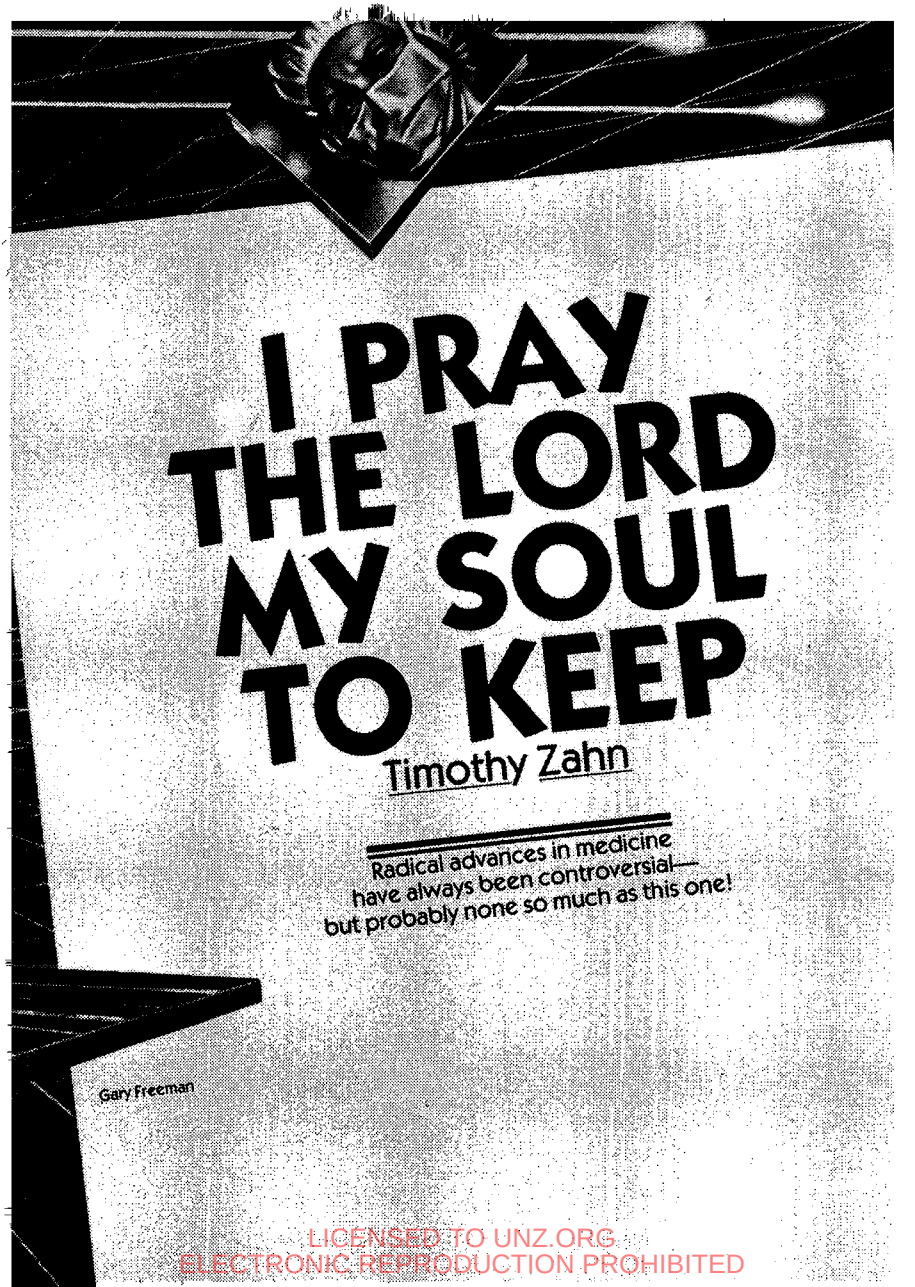

I PRAY THE LORD MY SOUL TO KEEP

Timothy Zahn

Radical advances in medicine have always been controversial—but probably none so much as this one!

Gary Freeman

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The evening's visitors had long since gone home for the night, as had most of the day staff, and the hallway outside the small equipment-packed room was as silent as a grave. Across the room, behind the medical repeater displays, the old Venetian blinds clattered quietly to themselves as imperfect window seals let in small gusts of the increasingly turbulent air outside. Shifting stiffly in his chair, Adrian Sommer groped for his coffee mug, trying to shut out the oppressive feeling creeping over him. Late at night, with the extra blackness of a storm approaching, was a horrible time to have to watch a man die.

That the old man visible on the TV monitor was going to die tonight there was little doubt. The doctor preparing one last hypo of painkiller knew it —Sommer had seen that same stolid expression on over a hundred faces over the past three years, and knew all too well what it meant. The family gathered together around the pastel-sheeted bedside knew it, too, even those who only hours before had been struggling vehemently to hide it from themselves.

And as for the old man himself . . .

Sommer sipped at his mug, his stomach burning with acid as the cold coffee reached it. *God,* he thought, *I hate this.*

Behind him, a chair squeaked. "I'm getting fluctuations," Jessica Sands announced quietly. "Won't be long now."

Sommer nodded. Pushing the morose thoughts away as best he could, he forced his mind back into work mode. "Mass reader is holding steady," he told her, giving the instruments arrayed before him a quick scan. "Nothing showing on the Kirlian yet."

"Might want to switch the Mullner off stand-by," Sands suggested. "I still don't trust the Kirlian to give us enough warning." She paused as the blinds rattled again, louder this time. "Hope the lightning holds off until it's over."

"Oh, certainly," Sommer growled. "It'd be a shame for him to die without us getting any useful data out of him."

The words had come out with more bitterness than he'd intended them to, but for once Sands had either the grace or the compassion to let it pass without retort. For a long minute the wind and the drone of cooling fans were the only sounds in the room; and then Sands's chair squeaked again as she turned to look over her shoulder at him. "I've been thinking," she said. "After we've finished with this set, what say we move operations somewhere else for awhile? LA or San Diego, for instance."

Sommer eyed her. "Something wrong with right here?"

"Oh, I don't know," she said. Too casually; and her eyes slipped away from his gaze. "It'd be a nice change of scenery, for starters. Climate's supposed to be better there, too."

Sommer felt his lip tighten. "Climate. As in they have fewer thunderstorms?"

Sands threw him a glare that was half resignation, half impatience. "What are you trying to prove, Adrian?" she demanded. "That you *like* the feel of knives twisting around in your gut?"

In his lap, Sommer's hands curled into impotent fists. "Running away isn't the answer," he told her stubbornly.

"I'd like to know what is, then," she countered. "Standing there and getting your feet knocked out from under you

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every time a thunderstorm moves through sure isn't doing you any good."

"I do *not* get my feet kn—"

"Hold it!" Sands cut him off, swiveling back to her instruments. "I think it's starting."

Sommer's eyes flicked to the main TV monitor, heart pounding in his ears. One look was all it took: the old man was indeed in his last moments. Flicking the selector on his other display to the Kirlian, he watched as the three-dimensional saddleshape began to flatten. "How's the Mullner?" he asked.

"Coming in strong," Sands said, a steady excitement creeping into her voice. "Fits the expected pattern: standard plus—oh, lots of embellishments."

Sommer squeezed the arm of his chair, a fresh wave of acid pain shooting through his stomach. Embellishments. As if the experiences and memories, the joys and sorrows of a lifetime had no more meaning than decoration. "Any anomalies?"

"You mean because of the Alzheimer's?" He sensed her shake her head. "No truncating of the memory traces or anything obvious like that. Something may show up when we run it through the computer, though."

On the monitor, one of the old man's daughters, her back to the hidden camera, had taken his hand. Sommer blinked back tears, glad that he couldn't see her face. "It's starting to detach," he told Sands.

"Right," she said, an odd tautness in her voice. "Watch *real* closely, Adrian."

"What—?"

There was no time to complete the question. On the monitor the old man suddenly stiffened . . . and suddenly the Kirlian trace went flat.

Or, rather, almost flat. For a second it seemed to hesitate; and then, like a strong fish being drawn in on a line, the saddleshape began to reform. "Jessica!" Sommer snapped, eyes locked on the image. "What in God's name—?"

The question faded on his lips as the saddleshape again flattened. For good, this time.

The old man was dead.

"Damn," Sands muttered behind him.

Sommer drew a shuddering breath, a sudden sweat soaking his shirt as he turned to face her. "I thought we'd agreed," he said, his voice trembling with suppressed emotion, "that we weren't going to try the trap again until we had a better idea of what exactly we were doing."

She looked back at him unblinkingly. "And we *do* have a better idea of what we're doing," she said calmly. "Every death we record gives us a better picture of how the lifeforce is mapped out—"

"How the *soul* is mapped out," Sommer corrected her.

She shrugged fractionally. "The point is that we've identified fifteen new characteristic curves in the trace since the last trap experiment, and I thought it was time to give it another shot."

She had a point—Sommer had to concede that. But that didn't excuse her setting up the run behind his back. "You could have told me," he growled.

The hard set to her eyes softened, just a little. "The anticipation is almost as hard on you as thunderstorms are," she said quietly. "You know, I meant what

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I said before about taking this show on the road."

Or in other words, the subject of her unauthorized experiment with the trap was closed. Temporarily, at least. "We can't afford to move," he told her flatly. "Our equipment is here, our computer contract is here, all our financial support is here."

She gazed at him, studying his face. "We're close, Adrian. Real close. You saw what happened; we had a genuine grip on the lifefor—on the soul—there."

"Except that it didn't look any better than the last attempt we made," he grimaced.

"Maybe, maybe not," she said. "We'll see what happens when the computer's chewed it over."

Sommer shook his head heavily. "It's not working, Jessica. Somewhere along the line we're missing something. Proximity requirements, pattern identification, power, trap design—*something*."

Sands's eyes flicked over his shoulder to the TV monitor. "Well, we're not going to be able to get the trap much closer without putting it in someone's lap," she pointed out. "But if it's pattern identification or one of the others, it's just a matter of time and experimentation."

Sommer sighed. "I know," he said. "It's just that . . ." He shook his head.

"I know; it's been a long road for you," Sands said quietly, her voice about as sympathetic as it ever got. "Look, I can pull all the packs and shut things down there. Why don't you go on home, OK?"

Sommer wasn't in the mood to argue. Outside, he could hear the rain beginning; the thunder wouldn't be far behind. If he got a sleeping pill down him fast enough, he could possibly be out before the worst of it hit. "OK," he told her, getting to his feet. "See you tomorrow."

For a moment he paused, his eyes shifting one last time to the TV monitor. The family had left the room now, and the doctor was tiredly turning off the various monitors. Sommer focused on the figure beneath the sheet; and as it always did, David's old bedtime prayer whispered through his mind:

Now I lay me down to sleep,
I pray the Lord my soul to keep.
If I should die before I wake,
I pray the Lord my soul to take.

Blinking back tears, he turned away. Fumbling for the doorknob, he left the room.

One of the advantages of the sleeping tablets was that they kept him from dreaming. One of the disadvantages was that they nearly always made him oversleep.

It was nearly eleven before he opened the door to the tiny office outside their equally tiny lab . . . to find that Sands had a visitor.

" 'Morning, Jessica," he said as the two of them looked up at him. "Sorry I'm late."

"No problem," she said, a touch of grimness in her voice as the man rose to his feet. "Mr. Westmont; my partner, Dr. Adrian Sommer. Mr. Thomas Westmont."

Westmont offered his hand, a quietly calculating look in his eyes. "Pleased to meet you, Dr. Sommer," he nodded. His hand was cool, disengaging with

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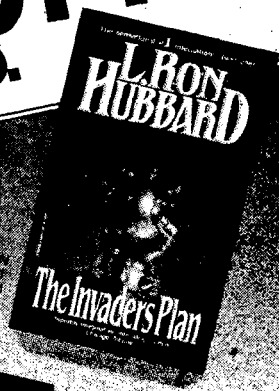

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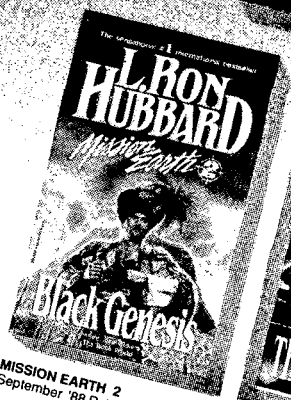

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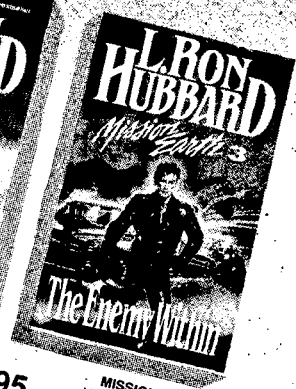

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practiced ease almost before Sommer had taken it. "I've just been talking with Dr. Sands about the possibility of offering some financial support for your Soulminder project."

Sommer studied him. "I was under the impression, Mr. Westmont, that our underwriters had agreed to keep Soulminder confidential."

Westmont waved a hand negligently. "Yes, well, you know how it is, Dr. Sommer. People have contacts, and those contacts sometimes let information slip."

"Those contacts are . . .?"

He shrugged, equally negligently. "I don't really think that's relevant, Doctor. What's important is that I have access to a great deal of money . . . and that you could certainly use that money."

Sommer glanced at Sands. Her expression was even more wooden than it had been a moment earlier. "It sounds wonderful," he agreed. "Where's the hook?"

Westmont's eyes went politely wide. "There's no hook, Dr. Sommer. All we ask is that we be kept abreast of your progress and that we be allowed to share in the various side discoveries you pick up along the way."

Sommer held his gaze. "Any particular side discoveries you had in mind?"

"Little things, mostly," he said with another shrug. "Any relationships or correlations you might have picked up between the shape of this soul-image of yours with, say, personality or intellect or whatever."

Somewhere in the back of Sommer's mind, the name belatedly clicked. "I see. You're *that* Thomas Westmont, are you?"

Westmont smiled, without even a trace of embarrassment or guilt. "I'm flattered that you recognize me."

Sommer felt his stomach knot up. "The case you're running for Senator Barnswell is hardly back-page news at the moment."

"Yes, but most of the media fascination is with the chanting idiots out in front of the courthouse," Westmont said, lip twisting with contempt. "Anyway, that's beside the point."

"Is it?" Sommer retorted. "Or do you expect us to believe that our data wouldn't show up in your case, the day after tomorrow, if we handed it over to you?"

Westmont cocked an eyebrow. "If you'd like, I'd be willing to agree that Senator Barnswell wouldn't release any of your data without discussing it with you first."

"That would be very helpful—*if* we could trust you to comply with such an agreement," Sommer said pointedly. "You'll forgive me if I say the senator and his associates don't inspire that kind of confidence in me. Don't forget, Mr. Westmont, that any misuse of our work is ultimately our responsibility."

Westmont's eyes narrowed. "Let's not bleed quite so much, Doctor, all right? A renewed sense of ethics may be all the rage among scientists these days, but the simple fact of the matter is that none of you are qualified to even *see* the long-term implications of your work, much less make any decisions concerning it. In a democracy, that's the job of the elected officials, the men in tune with the country's needs and wishes."

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"Like Barnswell?" Sands put in, heavily sardonic.

Westmont glanced at her, turned back to Sommer. "The bottom line, Doctor, is that you need money. You know it and I know it, so let's skip all the ethical posturing." Across the desk, Sands snarled something under her breath. "I can have a million dollars in your account by this afternoon," Westmont continued, ignoring her. "You would then have three days to collect your data into reasonably readable form and have it sent to Senator Barnswell's office."

"You'd be wasting the taxpayers' money," Sommer told him firmly. "The data is limited and raw, and any conclusions you tried to draw from it would be completely useless."

"Indeed?" Westmont cocked an eyebrow. "Are you saying there *are* indications there that you'd rather not be made public?"

"I'm saying nothing of the kind," Sommer growled, backpedaling from the edge of the verbal trap. "I'm saying that at the moment there's nothing solid *any*one can draw from the data. On *any* topic."

"Of course," Westmont said, almost soothingly. His hand slipped beneath his suit coat, withdrawing a slender wallet. Selecting a card, he flicked it onto the desk. "Think about it, Dr. Sommer, Dr. Sands. And consider the fact that you're down to your last shoestring on this. Without our money, Soulminder is finished." He nodded toward the card as he put the wallet away and gathered his topcoat from the back of a nearby chair. "Call me when you've made your decision."

The door closed behind him; and Sands spat a curse. "*Damn* him," she snarled. "Damn him, damn Barnswell—*double* damn the idiot who let this leak."

"Try to ignore him," Sommer said. The confrontation-induced adrenaline was draining away now, leaving behind a growing depression. Pulling over the chair Westmont had been sitting in, he sank into it, wincing at the residual warmth there.

"Ignore him, how?" Sands retorted. "In case you missed it, Adrian, Senator Bigot-Lunatic Barnswell and his brain-dead fringe know about us. How long do you suppose it'll be before they break the wonderful news that there are distinct and measurable differences between the souls of different races?"

"The differences are between individuals, not races."

"*I* know that," she snapped. "You think such subtleties aren't going to be lost once people like Barnswell get their grubby hands on it?"

Sommer gritted his teeth. "So what do you suggest we do?"

Some of the steel went out of Sands's back. "I don't know," she admitted. "We could release it ourselves, but Barnswell and everyone else with an axe to grind would jump on it and the final result would be the same. Not to mention that the publicity would probably scare off any potential renewals by our underwriters."

Something in her voice . . . "You aren't seriously considering Westmont's offer, are you?" Sommer frowned.

She took a deep breath, her eyes meeting his with visible effort. "He was right, Adrian," she said softly. "Soulminder *is* on its last shoestring here.

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Besides, we'd have three days to run the data through some more analysis —maybe decorrelate it beyond even Barnswell's ability to distort it."

Sommer stared at her. "Jessica, maybe to you this is just another job—"

"You know better than that," she snapped. "Soulminder is just as important to me as it is to you. But all the sentiment in the world isn't going to change the facts. A, that we're broke; and B, that Barnswell has money."

Sommer locked eyes with her. "I am not," he said, biting out each word, "going to let people like Barnswell get their filthy hands on Soulminder. Period; end of discussion."

For a long moment they glared at each other in silence. Sands blinked first. "I don't much like it, either," she sighed. "Look . . . that stuff about moving to LA last night wasn't all froth. I've got some feelers out to the police department there, trying to get them interested in the possible forensic applications of our Mullner-trace work. Why don't I fly out there and see if I can squeeze some money out of them, hmm? It would at least postpone any decision on Barnswell's offer."

"The decision's already been made," Sommer told her stubbornly.

Her standard patient expression began to look a little strained. "Sure," she said. "All the more reason for me to shoot over to LA."

Sommer got back to his feet. "Yeah, go ahead," he told her tiredly. "Has last night's data been chewed over yet?"

"I got it running before Westmont arrived," she told him, reaching for the phone. "It'll be done soon if it isn't already."

"Thanks," he nodded.

She was busy punching up the Consolidated Airline Registry as he stepped through the back door of the office into the lab.

Keying off the last page of the correlation analysis, Sommer leaned back in his chair, reaching wearily for his coffee cup. Sands's gut-feeling statement the night before had been correct: the basic kernel of the old man's soul-image was indeed the same as all the other hundred-odd Mullner traces they'd collected over the last three years. Just the same, without any new correlations the analysis could detect.

In other words, the deathwatch had been a total waste of time and effort.

As had been the one before, and the one before that, and the one before that. The last five samplings combined, in fact, had yielded only a single new correlation factor; and even with a hundred samples to do comparisons of, they still didn't have the slightest clue as to how the incredible tangle of embellishments could be interpreted, read, or otherwise made use of.

Soulminder wasn't just running out of money. It was also running out of steam.

"Nothing, huh?" Sands said from over at her own terminal.

Sommer shook his head. "Not a drop. I think we've finally hit the wall, Jessica."

She grunted deep in her throat. "Well . . . no one ever said this was going to be easy. Have you tried doing a similarity analysis on the embellishments yet?"

"The program's still running, but I'm

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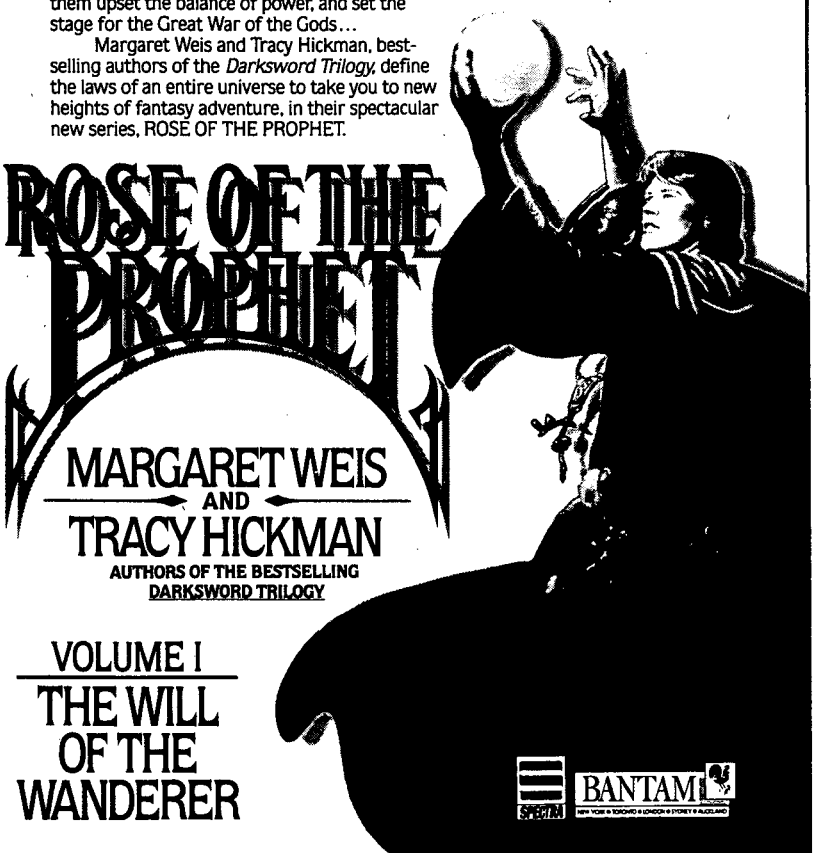

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not expecting anything. If the computer can't even distinguish Alzheimer's patients from normal people, it's sure not going to be able to find anything more subtle."

Sands swiveled her chair around to frown at him. "Last night must have hit you pretty hard. You usually bounce back from blind alleys a lot better than this."

He shrugged. "Maybe I've bounced off one blind alley too many. Maybe the whole concept of Soulminder is just one massive blind alley."

"No," Sands said firmly. "It's going to work—we're going to *make* it work. We just haven't got the right handle on it yet—and we're not going to find it sitting around feeling sorry for ourselves."

Sommer took a deep breath, exhaled it between tightly clenched teeth. She was right, as usual. "All right," he growled. "Let's run it by again. We've proven the existence of the soul—or at least that there's *something* that leaves the body at death," he corrected himself before she could do it for him. "We can make a trace/map of this thing, show it consists of a common kernel plus embellishments, the complexity of the latter correlating slightly with age. We can even trap the soul for—how long did you have hold of it last night?"

"Two point three seconds. Up two tenths of a second from the last time."

He nodded. "And *that* gain represents fifteen new correlation points to set the trap for, plus nearly four hundred thousand dollars' worth of improvements, *plus* setting the trap directly beneath the patient's bed." He waved his hands helplessly. "So where do we go from here?"

Sands's lips compressed briefly. "We stall for time," she said. "We find something else of commercial or scientific value in the Mullner traces and peddle it to interested customers in exchange for fresh money."

He eyed her suspiciously. "Like Senator Barnswell, for instance?"

"I didn't say that," she said. But there was a distinctly defensive set to her mouth. "I don't especially want his hands on our data either, you know. Do bear in mind, though, that there's absolutely no evidence in our Mullner traces to support his small-minded opinions. All he'd do would be to make a fool of himself if he tried it."

"A fool, or a martyr," Sommer said sourly. "He may be smart enough to play the one into the other. And don't forget that there are a lot of people out there whose brains shut down when they're faced by loud people waving scientific data."

Sands's eyes slipped from Sommer's gaze, came to rest on the trace printer—a highly sophisticated piece of equipment that they still owed nearly ten thousand on. "All right, Adrian," she said. "There's no point in discussing it anyway, until I get back from LA. Which reminds me—" she glanced at her watch— "I really ought to get home and pack."

"Will you need a ride to the airport?" Sommer asked as she keyed off her terminal and got to her feet.

"No, thanks—I've got an airport limo coming to get me. Oh, here—" she scooped up a folder and handed it

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to him. "If you get a chance, you might want to file this into the database."

Sommer accepted the folder and glanced at the first page. The psychological profile and history of the man they'd watched die last night. "Sure," he sighed, tossing it onto his desk.

"OK. Be good, and I'll see you tomorrow evening."

For several minutes after she left he just sat in the quiet room, staring at the display before him. So close . . . and yet so very, very far.

Sands didn't understand. How could she? For all her enthusiasm she still saw Soulminder as little more than an intriguing challenge—a challenge, and perhaps the road to future wealth and fame. A scientific and technological breakthrough, to be treated on a scientific and technological level.

Not as a way of saving lives. Certainly not as a memorial.

For a minute Sommer teetered on the brink of self-pity. But there was work to do . . . and anyway, he'd traveled that road all too often in the last eleven years. Taking a deep breath, he picked up the folder Sands had left him and opened it up.

It wasn't as depressing as he'd feared it would be. There was the heavy sense of a wake about it, certainly, leafing through the facts and figures of a man now dead. But on the other hand, the man *had* been old; had lived a full and rich life before the effects of aging and Alzheimer's Disease had sapped him of his strength and memory. Sommer turned the pages, scanning the records of the man's childhood and youth, a copy of his marriage certificate, the beginnings of his family—

A hand seemed to close over Sommer's heart. *First-born son, Harold,* the line read. *Died 8/16/30, five years old.*

The page dissolved into a blur as fresh tears rose to Sommer's eyes. The same age as David had been. . . .

Except that, in this man's case, life had continued on afterwards. He'd pulled himself back together, kept his wife, had had more sons and daughters. He hadn't let his son's death become an obsession. . . .

Angrily, Sommer rubbed the moisture and self-pity from his eyes. "It's not like that," he snarled aloud to the empty room. He *wasn't* just doing it for David, but for every child who'd ever had to die unnecessarily. For every parent who'd ever had to face such a crushing trauma—

Abruptly, his train of thought froze on its rails. *Trauma:* an injury or shock to a person's body or psyche. And, perhaps, to the pattern of embellishments making up his soul-trace?

And if so, would similar events cause similar changes?

He looked up, glancing around the room. Their main Mullner setup was still back at the hospice, but they had a secondary one that Sands was forever tinkering with . . . there it was. The recording itself would be no problem—he could skip the data pack and just run it directly into the computer's memory. If Sands wanted something of commercial value, this might just do it.

For a moment he hesitated as natural caution reasserted itself. They hadn't hooked a living person up to the Mullner since the very first calibration readings, and Sands had boosted both the power and read-density a hundred-fold since

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then. Besides which, basic safety rules said never to try something new alone.

But it could easily take a day or more to find the proper correlation between his soul-trace and that of the old man . . . and if Sands came back from LA empty-handed, she might not be willing to wait that long.

The thought of Barnswell's bigots with their hands on David's memorial made up his mind for him. Pushing his chair back against the Mullner computer feed, he got to work.

The first time he'd gone under the Mullner, Sommer had been struck by the dreamlike qualities the device seemed to induce. Now, after Sands's improvements, the effect was even stronger. Sitting alone in the lab, the walls of which seemed to fluctuate between too close and too far, he listened to the hum in his ears and brain.

And dreamed of David.

David's birth, and the sixteen-hour labor that Sally had had to go through to bring him into the world. David's first step, months later, which had careened him headfirst into the corner of the coffee table. David at his day-care center when he turned two, at first impossibly shy and then turning completely around to become the world's shortest tyrant.

David on the night of his death.

Sommer had relived that night a hundred thousand times in the past eleven years, and though the emotion surrounding it had subsided from an exquisitely sharp pain to a dull background ache, the wound had never entirely healed. Would never heal. Behind the hum of the Mullner, he could once again hear the wild thunder of that night; could see David's unconscious, almost comatose face; could feel his own mindless urgency as he sped through the night, praying that a police car would stop him and give him an escort to the hospital; could feel his horror as he rammed the car headlong into the flooded viaduct and heard the engine stall.

Could feel his utter helplessness as he watched David die.

The funeral. His frustrated grief, sublimated into the burning need to find some way of keeping such unnecessary deaths from ever happening again. His growing obsession with the Soulminder project—yes, he could admit now that it had been an obsession. Sally's inability to understand his drive and reliving of the past; ultimately, her inability to put up with it and him any longer.

David would have been sixteen this year. Sommer tried to envision him as a teenager; but he couldn't. The small, five-year-old face kept intruding, and eventually he gave up the effort. The face faded, and he drifted off into other, less painful dreams. . . .

It seemed to take him a long time to find his way back to consciousness; and when he finally became aware he discovered that, at least, hadn't been an illusion. His desk clock read 6:20: two hours and four minutes exactly since he'd activated the Mullner. Blinking aching eyes, he worked himself out of his chair and limped over to the computer. Even with the relatively low read-level he'd set the Mullner on it shouldn't have taken nearly that long; and, sure enough, the time indicator showed the Mullner had finished its trace two hours and two minutes earlier and had been

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waiting patiently ever since then for new instructions.

With a sigh, Sommer keyed for storage and duplication of the trace and then took a moment to stretch stiff muscles. Knocking him out for two hours was a new trick, something the original Mullner model hadn't been capable of, and for a minute he wondered uneasily if he was in for a long night of equally unexpected side effects. But aside from fatigue and a few muscle twinges he felt all right, and dismissed the worries as being overly paranoid.

His stomach growled, reminding him it was dinner time. Taking a deep breath, rib cage creaking with the effort, he sat down at the terminal and began to set up the comparison program. There would be plenty of time to run over to the deli down the street after the computer was chugging away.

As he worked he thought about the dreams. And wondered whether the Mullner apparatus induced similar ones in the dying.

"It's amazing the tricks one's mind plays when one starts getting old," Sands said conversationally, her fingers dancing nimbly over the relevant sections of the two Mullner traces. "Take me, for instance. Thirty-six is hardly approaching senility; and yet, I would have *sworn* I could take off crosscountry for a day without worrying that my partner would do something damn-fool stupid."

"Guilty as charged," Sommer said, mentally urging Sands on. "Except that anything that works isn't stupid, is it?"

"You're thinking of treason," she corrected him absently. " 'For if it prosper, none dare call it treason.' Stupid risks are always stupid risks." She hissed between her teeth, a sound that was as much thoughtful as it was deprecating.

Sommer could stand it no longer. "Well? What do you think?"

Sands hesitated, then shrugged. "I don't know, Adrian. I really don't know."

"Why not?" he demanded. He jabbed a finger at the spots where her fingers rested. "The exact same curl on both of our Mullner traces?—what else could it be?"

"You're assuming—again—that it's the topography of the embellishment tendrils that's significant," she reminded him tartly. "We don't *know* that that's true. Besides which, you'll note that the two curls aren't in anywhere near the same area. How do you explain *that?*"

Sommer sighed, feeling the excitement of the discovery beginning to fade and slip from his grasp. "I don't explain it," he told her tiredly. "I presume it's related to the differing circumstances of our sons' deaths—timing, emotional impact, life afterwards; that sort of thing. *Yes,* there's a lot more work that'll need to be done on it . . . but it *is* a start. Isn't it?"

"Of course it's a start," she soothed him. "It's not exactly where we wanted to go with Soulminder, but anything that helps us understand the lifeforce certainly qualifies as progress." She waved a hand helplessly. "But whether it's enough to shake more money out of our underwriters is something else entirely."

Sommer clenched his hands into fists.

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"Did the people in LA give you any kind of timeframe for their response?"

"If you mean can we get this written up and sent to them before they make a decision, yes. Whether it'll affect the decision I don't know." She hesitated. "And at any rate, we're talking about long-run support here. Not short-run."

"Barnswell is not getting his hands on Soulminder," Sommer said flatly.

Her lip twisted, just a bit, before she could smooth out the gesture. But it was there long enough for Sommer to read the impatience there. "Look, Adrian, I know how you feel—"

"No, you don't," he cut her off brusquely. "We both know what Barnswell would do with the data—he'd tear it apart until he found something he could use as evidence for his petty little racist prejudices. And in the process he'd destroy Soulminder."

"Oh, come *on*," Sands snorted. "Aren't you getting just a little melodramatic here?"

"Am I?" Sommer countered. "You really think potential underwriters will want their names and corporations associated with us after that?"

Sands grimaced and for a moment was silent. "Maybe we can get some guarantees from him up front," she said at last. "A written promise not to release any of the data without our permission. Westmont more or less offered that, you know."

"And what if he reneges on it?" Sommer demanded. "Sue him for breach of contract? It would be a useless gesture—the damage to Soulminder would already have been done."

Sands looked him straight in the eye. "A million dollars is a lot of money, Adrian," she said softly. "A hell of a lot of money."

"No."

For a long moment they just stared at each other. Then, reluctantly, Sands broke the contact. "All right," she sighed. "I guess I understand. Well . . ." Getting to her feet, she headed for the door. "I guess I'll go back to the hospice and pick up the trap."

"I thought Dr. Samuels had another volunteer patient lined up for the room," Sommer reminded her.

"He does, but the prognosis gives her another two to four weeks to live, and I thought I'd see what else I could do with the trap. Maybe boost the range or focus—it's got to be one of those that we're missing out on. See you later."

She left, and Sommer turned his attention back to the two Mullner traces spread out on the desk. Somewhere here was the evidence they needed to bring fresh money into Soulminder. . . .

A million dollars.

Tears blurred his eyes, and he sank down wearily into his well-worn chair. A million dollars. A million filthy dollars. From a filthy little man with a filthy little mind.

And Sands was probably on her way right now to get it for them.

"Damn!" he swore viciously, uselessly, to the empty room. Sands didn't care a burned-out diode for his vision of Soulminder. Only for Soulminder itself. Coldly determined to make Soulminder work, willing to sell her own mother to see it work.

An iron-ringed, single-minded goal . . . without which, Sommer knew full well, she would long ago have left him to carry the burden alone.

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He sighed, hearing defeat in the sound of rushing air. Sands would sell their data to Barnswell—if not today, then tomorrow or the next day. And there was nothing he could do to stop her. Even if he'd had the strength of will left to fight her; even if she didn't really have as much right of ownership to the data as he did. She would sell out, and Barnswell would give her his assurances . . . and as soon as her back was turned he would do what he damn well pleased, anyway.

His eyes drifted to the file cabinet where the hard copies of their precious Mullner traces were stored. Little more than complex curlicues of ink on paper . . . as people themselves were little more than a collection of exotic chemicals. Each trace—somehow—the record of an entire life. The life of someone who'd allowed him to share in the very private moment of death. . . . and had trusted him to respect that privacy.

Sommer clenched his hands into fists and took a deep breath. "All right," he said aloud, getting to his feet. It would probably make Sands furious if and when she found out—and was almost certainly unethical to boot—but at the moment his tacit promise to the souls he'd traced mattered a lot more than either consideration.

The project took nearly an hour to complete. Repeating the operation on the duplicate computer files was considerably easier, taking less than a quarter of that time, and when he was done he sat back in his chair in vaguely guilty satisfaction. Barnswell could now have the data; and if he misused it he, and not Soulminder, would be the one to suffer most.

Or so Sommer hoped. At the very least, the individuals who'd let him take their soul-traces would be unaffected—

He paused in mid-thought as something suddenly occurred to him. Something so obvious that he couldn't believe he hadn't thought of it before. . . .

For a long moment he just sat there, gazing off into space, feeling an old fire he thought he'd lost forever begin to burn again within him. Leaning forward, he attacked the computer keyboard.

A minute was all it took to hit the first wall. Muttering under his breath, he scooped up the phone and punched for their hospice room.

Sands answered on the third ring. "Hello?"

"Oh, great, you're still there," Sommer said. "Listen, do you remember where the data on the Mullner trace recognition pattern is stored?"

"Uh . . . try a file called FITTER.CV," she suggested. "Or something like that—I'm sure FITTER is part of it. What do you want it for?"

"I think it's time we took another shot at that approach," he told her, struggling to keep his voice at least reasonably calm.

"What, you mean tailoring the trap to the individual soul? I thought we proved way back when that even a supercomputer wouldn't be fast enough to record the Mullner trace and configure the trap fields in the time available."

"Right," Sommer agreed, "—*if* we wait until the moment of death to take the reading. What if we instead take the initial trace beforehand, like I did last night?"

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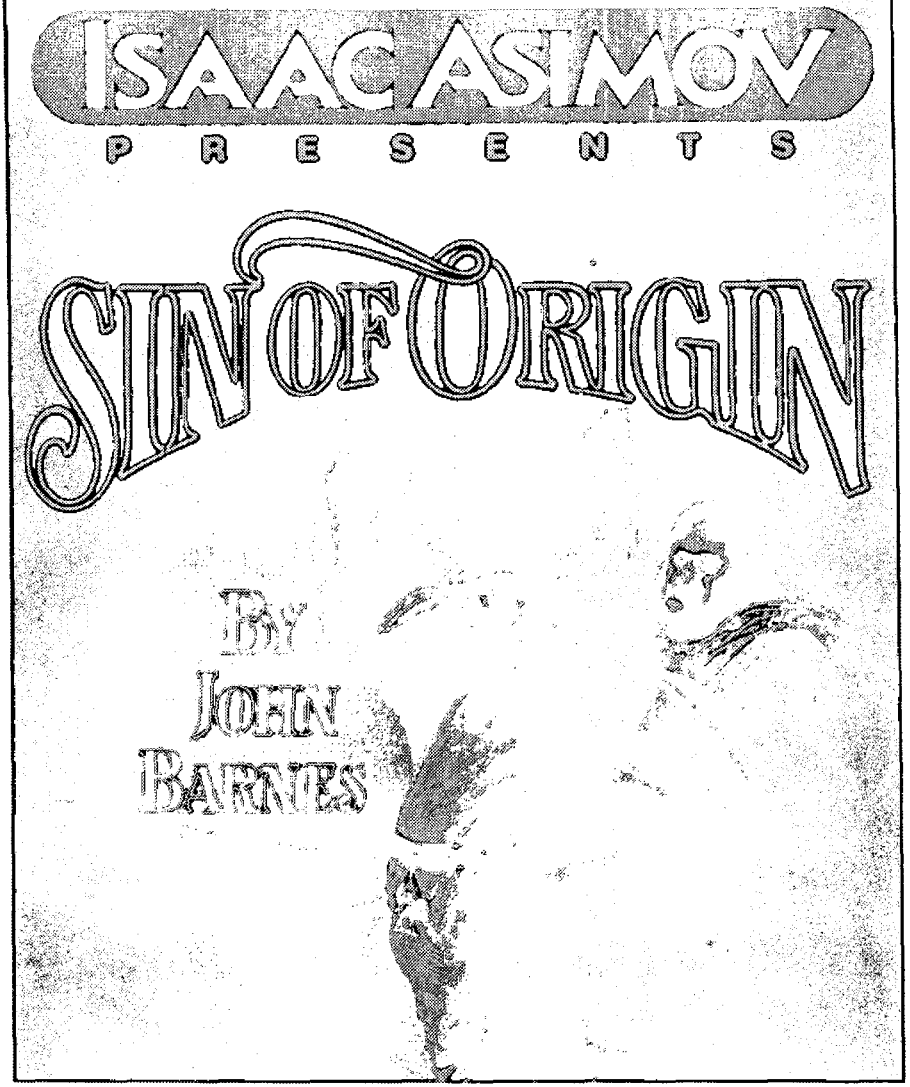

"Only the very best science fiction starts arguments, and people will be arguing over this book for many years to come."

--Janet Kagan

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There was a long silence on the other end of the line. "I don't know," Sands said at last, slowly. "It's not exactly the way we wanted Soulminder to work—you plug your average accident victim into the Mullner and you're likely to kill him right there and then. You saw what it did to you."

"So find a way to modify the Mullner," Sommer ground out, beginning to be annoyed at Sands's attitude. "Make it gentler but still able to take the entire trace. At least it's something to try."

"I agree," Sands said calmly. "I'll see what I can do when I get back. Meanwhile, you might call Dr. Samuels and see if he can scare us up a guinea pig. Best bet is probably someone who's reasonably healthy at the moment but needs some risky surgery."

"Uh . . . right," Sommer managed, thrown off-balance a bit by her abrupt switch to his side of the argument. "I'll do that. See you later."

" 'Bye."

They worked late into the night, Sommer on the computer software and Sands on the trap itself, until a throbbing headache forced Sommer to call it quits. Sands remained behind; and when he arrived the next morning there was a note from her telling him that, as of 5:30 A.M., the hardware modifications to the trap were complete. The note wished him luck with the software, and suggested he not expect her in too early.

Sommer got to work; but before he did so he took a moment to check the flag he'd planted in the Mullner-trace computer files.

The files had indeed been copied, just after he'd left the evening before.

Not unexpected, though it still hurt that Sands would go behind his back and against his wishes like that. But, oddly enough, even such duplicity was unable to dampen the growing enthusiasm within him—the gut-level sense that this time they were indeed on the right track. With any luck, Barnwell's million would take them far enough along that track that they would never again have to deal with him or his kind.

It took four more days to finish the software modifications, and another two after that to complete their limited repertoire of simulation tests. At that point, there was nothing to do but wait for Dr. Samuels to locate a likely patient.

Three days later, he did.

"You have to understand," Dr. Dian Janecki said gently, "that with this type of operation the chances of success are directly proportional to the immediate risk involved. The more of the medulloblastoma we can clean out of your son's cerebellum, the better his long-term chances of survival; but at the same time the deeper we go in and the longer we stay there, the greater the dangers of the operation itself."

"We know that, Doctor," Peter Coleman said impatiently, the strain of his son's long illness etched on both his and his wife's faces. "If you're going to suggest more chemical treatments, don't bother. All they do is make Danny sick, and they aren't helping him a damn."

Janecki nodded her agreement. "I know that. And my colleagues and I agree that we really can't put off surgery any longer." Her eyes flicked to Sommer. "What I'm going to offer you

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is—well, maybe it's an unexpected bit of hope. Dr. Sommer, if you and Dr. Sands would care to explain your proposal . . .?"

Sommer mentally braced himself. "What we have, Mr. and Mrs. Coleman, is—maybe—a way to give Dr. Janecki that extra time she wants while still minimizing the risks of the surgery itself."

They listened in stony silence while he explained, and for a long minute after he'd finished the silence lingered. Coleman spoke first. "No," he said firmly. "Out of the question."

Huddled beside him, his wife twisted her head to throw him a startled look. "Peter—?"

"Out of the question, Angie," he repeated, more emphatically this time. "It's unnatural, it's unworkable—" he threw Sommer a suspicious glare—"and I'm not sure that it's not downright blasphemous right along with it."

"All surgery is unnatural," Sands pointed out calmly. "So is all medical treatment, if you want to come down to that. As for unworkable; yes, we freely admit that we can't guarantee success. But if we don't try, it'll never work."

Coleman sent her the same glare he'd just given Sommer. "You are *not* going to experiment on my son," he growled.

Angie's hand tightened its grip on her husband's. "Peter, if there's even a *chance* it might help, why not try it?"

He looked down at her. "Why? I'll tell you why." He looked back at Sommer. "Tell me, Doctor, what happens if your Soulminder gizmo works but winds up damaging Danny's soul in the process? Or what if you can't get it back into Danny's body afterwards?—or can't get it out at all?"

They were, Sommer had to admit, good questions. "I don't know," he told the other honestly. "Releasing the soul from the trap shouldn't be a problem—shutting off the power will do that much. But as to the rest of them, we just don't have any answers yet."

"They can't hurt Danny's soul," Angie said, a new trace of firmness creeping into her voice. "There's nothing this world can do to a person that God won't heal in the next life."

"And what if God rejects Danny because he was part of something blasphemous?" Coleman countered. "What makes you people think you can stuff a human soul into a machine, anyway?"

"You could argue that the human body is nothing but a biomechanical machine," Sands pointed out. "Yet *it* manages to hold onto the soul quite adequately."

Coleman visibly clenched his teeth, shifting his eyes to Janecki. "What's *your* opinion of this, Doctor?" he demanded. "You really believe they can do it?"

"I don't know," Janecki told him. "All I can say is that in my lifetime I've seen a lot of medical advances, some of which sounded a lot less plausible than this one. It's your decision, of course . . . but in my opinion I don't see any reason not to give it a try."

"So that you can go in as deep as you want to?" Coleman snapped. "Is that it? So you can play with your scalpel and hope that this half-baked idea will cover any mistakes you make in there—?"

"It doesn't matter," Angie spoke up,

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with an unexpected strength in her voice that made him pause and look at her. "Dr. Janecki is going to try to get as much of the tumor out as she can, whether we use Soulminder or not." She blinked tears from her eyes as she looked at her husband. "Danny's going to be healed thoroughly," she said quietly, "or he's going to die. Right here, right now."

Coleman licked his lips, concern replacing the antagonism in his face. "You don't mean that, Angie. Where there's life there's always hope."

She shook her head. "Not any more, Peter," she said, an infinite weariness in her voice. "Not for me, not for Danny. Can't you see that he's been through enough hell already with this?" She looked at Janecki, swallowed hard. "He's not going to spend the next five years of his life in and out of hospitals, Doctor, and then die anyway," she said. "Heal him completely . . . or let him go on to God."

Janecki nodded, her own eyes a little moist. "I understand, Mrs. Coleman. I'll do everything I can." She glanced at Sommer. "About Dr. Sommer's proposal, then . . .?"

Angie looked up at her husband. Coleman grimaced; but when he broke from her gaze and looked at Sommer there was no resistance left. Only resignation. "Go ahead, Doctor," he sighed.

Sommer nodded, a swirl of sympathetic pain and dark memory tightening his stomach and throat. "Thank you," he said quietly. Soulminder's first real trial run . . . with a five-year-old boy as its subject. Unbidden, David's face rose up accusingly before his eyes, and the ache in his stomach grew worse. *A five-year-old boy,* he thought morosely. *God, why did it have to be a five-year-old boy?* "We'll have to do a tracing," he forced himself to say. "With your permission, I'll go ahead and set up for that right away." He got to his feet, wondering how he was ever going to face the boy in there—

"I'll handle that," Sands put in smoothly, standing up beside him. "You can go with Dr. Janecki and start setting up the equipment in the operating room. Mr. and Mrs. Coleman, perhaps you'd like to come and watch me—the procedure's completely painless, but I imagine Danny would like your reassurance of that."

They nodded. Getting silently to their feet, they followed Sands from the lounge.

"I hope, Doctor," Janecki commented into the silence, "that you're right about all this."

Sommer took a deep breath. "I do, too. I know what they're going through, Dr. Janecki; I lost a son myself eleven years ago."

"I'm sorry," Janecki said, her eyes locking onto his. "What I meant was that I hope you're right about Soulminder not doing any . . . damage."

Sommer felt his stomach tighten. "I hope so, too," he said quietly.

The boy's face was painfully thin, a thinness that his shaved head and the size of the operating table beneath him only served to emphasize. Watching the small monitor screen as they prepared him, Sommer felt a fresh ache in his heart. Danny was so young . . . just as

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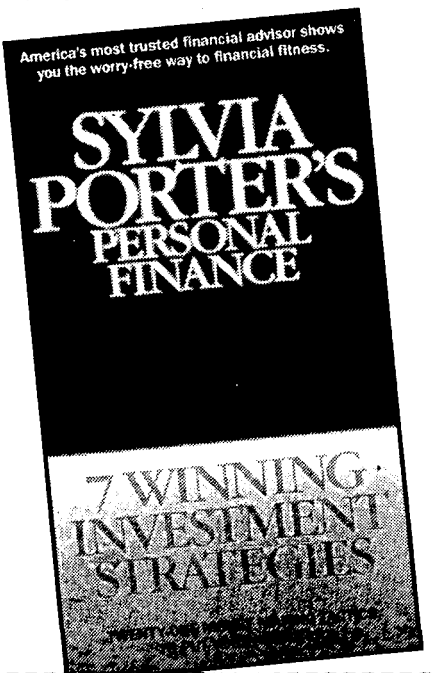
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David had been. *If I should die before I wake . . .*

"Adrian?" Sands's voice came from the speakerphone beside him. "Things underway there yet?"

With an effort, Sommer forced the memories back. "They're just getting ready to start," he told her. "You getting everything all right?"

"Coming in clear and clean," she assured him. "The trap here is set and running."

"Same here," Sommer said, wondering if this particular elaboration had really been necessary. If the trap set up beneath the operating table failed to catch Danny's soul, after all, there was virtually no chance that the backup duplicate Sands had going in their lab would be able to do so. But on the other hand, distance might not be the significant factor, and the more sophisticated computer back there might be able to feed Sands's trap a better Mullner trace than could the portable machine humming along at Sommer's side.

Besides which, it was probably better that Sommer be here alone. Already he could tell that it was going to be a morning filled with thoughts of David, and Sands's presence would only be an intrusion. "Kirlian and Mullner both look strong," he added.

"Same here," Sands confirmed. "By the way, I noticed a few minutes ago that the trap software was doing a continual scan of the entire Mullner-trace file. Is it supposed to be doing that?"

Sommer cursed under his breath. "Not really. I put that in as a secondary system in case the primary targeting flag got confused and lost hold of its target trace. I guess it did."

"Fixable?"

"Not now," he sighed. "I'll have to tear the targeting software apart and completely rebuild it. Damn—I *knew* we were going to have trouble with that."

"Well, no harm done," Sands assured him. "This is only here for backup anyway, remember. As long as it doesn't latch onto one of the already departed and yank them back from heaven, that is."

"Not funny, Jessica," Sommer growled.

"Sorry. They started there yet?"

He peered at the scene. "Looks like they've just finished putting him under," he told her.

"Good. Be sure and keep a close watch on the EEG trace—if something starts to go wrong, we'll want as much warning as possible."

"Sure," he said between stiff lips. There was an odd note of anticipation in Sands's voice; a quiet eagerness that sent an unpleasant shiver up his back. On some level, he realized, she was actually hoping Danny would die this morning. . . .

The operation began.

For Sommer, it was an exercise in tense boredom. The camera had been positioned with convenience rather than a clinical view in mind, and it was rare when he got even a glimpse of the operating field beyond the wall of green surgical gowns. The surgeons' voices, when he was able to hear them over the beeping of monitoring instruments, were calm and businesslike: the voices of people accustomed to holding human lives in their hands. Besides the TV monitor the bank of repeater instruments

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punctuated the minutes with the monotonous constancy of a steady heartbeat, while the quiet scratching of pens recorded brainwave pattern and blood pressure on strips of paper. The minutes stretched into an hour; into an hour and a half; into an hour and three-quarters. . . .

And precisely an hour and fifty-two minutes into the operation, it abruptly fell apart.

"Adrian!" Sands snapped over the phone.

"I see it," Sommer gritted, fists clenched in agonized helplessness. *If I should die before I wake . . .* "Looks like neurogenic shock—no blood's getting to his tissues. The EEG . . . God, Jessica, they're losing him."

"Steady, Adrian," she said tightly. "Don't worry, we'll get him. Everything reading ready?"

He tore his gaze away from the frantic activity on the monitor to give the Soulminder instruments a quick scan. "It's all set," he told her, stomach churning. He'd fought to hold onto some semblance of professional calm through this, but now he could feel it boiling away like an ice cube on a hot burner.

Eleven years later, he was once again watching helplessly as David died. "No," he half whispered, half groaned.

Once again, hope and wish proved inadequate. Two minutes later, it was all over.

"Adrian!" Sands barked. "What the hell's happening?"

"He's dead," Sommer said mechanically, his eyes on the flat EEG trace. "It was . . . it all happened so quickly."

"Never mind that," Sands bit out tautly. "What about the trap?"

Sommer broke his gaze from the EEG, recognizing even as he did so that he was afraid to look at the Soulminder instruments. If it hadn't worked . . .

The trap registered active.

He tried twice before he could get the words out. "It's got him," he breathed at last. "Jessica, it worked. It's really *got* him."

Sands's shuddering sigh whistled through the phone speaker. "OK," she said. "Good. Great. But we're not out of the woods yet—we still have to get him back in his body—"

"Hold it," Sommer interrupted her. On the monitor Dr. Janecki had stepped up to the camera's microphone. "Dr. Sommer?" she called. "Should we continue with the operation?"

He licked his lips, switched on his intercom. "Yes," he said. "The first stage seems to have worked."

Even on the small monitor screen, he could see relief smoothing out the lines around her eyes. A cautious and almost disbelieving relief. "I understand," she said.

She turned away and began issuing instructions, and Sommer flipped off the intercom. "Dr. Janecki's going to continue the operation," he told Sands. "They're getting the heart-lung machine set up—looks like they've got a hypo of neuropreservative, too." He shivered at the thought. Neuropreservatives were still highly experimental, and what they did for dying brain and nerve cells was usually more than offset by the hallucinations and associated emotional trauma they inflicted.

But, of course, Danny wasn't there to feel any of that.

"Well, she's the doctor," Sands

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grunted. "Probably knows what she's doing. You think I should go ahead and shut down the backup trap?"

"No, leave it running," he shook his head. "There's no guarantee this one'll keep going long enough, and if we really have Danny's soul here I don't want to lose it now."

"Good point," she agreed. "Keep an eye on the readouts, and if anything changes let me know right away."

"You'll be the first," Sommer assured her, a trace of humor seeping through his own fading tension. Leaning back in his chair, he took a deep breath, his eyes drifting to rest on the trap. A big, ugly conglomeration of hardware, sophisticated electronics, and software . . . and now the temporary resting place for the soul of a five-year-old boy.

Or, at least, he hoped that was what was there. It could, he reminded himself soberly, just as easily be nothing more than an echo of Danny's Mullner trace; or a secondary trace made of Danny's now-gone soul; or something else entirely.

Only time would tell. Time, and a successful attempt to return the soul to Danny's body. Only then would they really know.

For now, all he could do was wait. And hope that Sands's off-handed comment about pulling someone else back from heaven had been only a joke.

"Well," Janecki said heavily, "I guess this is the moment of truth."

Sommer grimaced, blinking uselessly against the grit that seemed to have become a permanent feature of his eyes during the past two days. "I hate that phrase," he growled. "Truth is an ongoing reality—it doesn't come in moments."

Janecki threw him an odd look, and he grimaced again. "Sorry," he muttered, reaching over to make one last adjustment to the waveguide cable arrangement connecting the Soulminder equipment to Danny's still body. "I'm a little nervous, I guess."

"Probably short of sleep, too," Sands commented, peering closely at the contact band circling Danny's head. "I've never found hospital cots to be all that comfortable, myself."

Sommer nodded silently. In point of fact, he'd hardly had any sleep at all the past two nights. Lying there in the dark, beside the Soulminder trap, had reawakened memories of the long bedside vigils during David's last illness, and what little sleep exhaustion had forced on him had been filled with nightmares. "What do you think, Jessica?" he asked. "We ready to give it a try?"

She straightened, and for the first time he noticed the tension lines about her mouth. "As ready as we're ever going to be," she agreed.

"Dr. Janecki?"

She stepped over to the controls of the heart-lung machine. "I'm ready."

Sommer looked over his shoulder, to where Danny's parents stood silently against the wall. Then, setting his teeth firmly together, he turned back and reached for the trap release. *If I should die before I wake . . .*

He touched the switch.

The lights indicating the soul's presence flicked out, and for a single, terrible, split-second eternity he was sure he had failed. David; now Danny—

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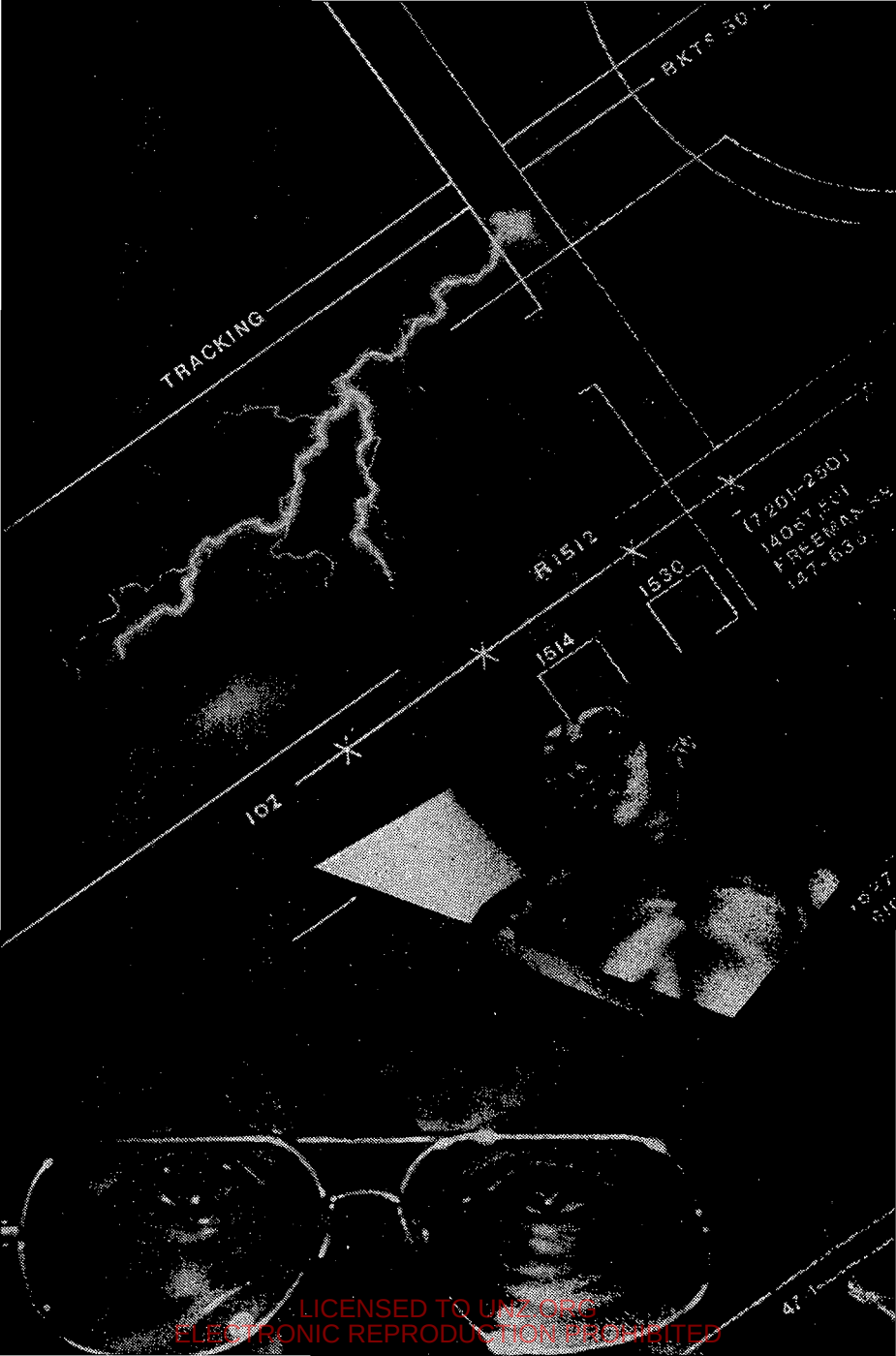

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And suddenly Danny's body twitched violently. "Mommy!" he croaked. "Mommy!"

She was there in an instant, her husband half a step behind her. "Danny!" she gasped, enfolding him in her arms.

And even as his eyes blurred with tears, Sommer felt his knees go weak. Turning away, he groped his way to a chair and collapsed into it.

"You OK?"

He blinked away the tears to find Sands squatting down beside him, her face shining with disbelief-tinged triumph. "We did it, Jessica."

"I know," she said, taking his hand and squeezing it. "Congratulations."

"You too," he breathed. It was over. After eleven years, it was finally over.

No. It was just beginning. "We still need to check Danny over," he told her quietly, forcing back the growing euphoria. "Make sure he's undamaged; make sure—" *it really is him*—"his memory and everything else is all right," he said instead. The thought that someone other than Danny might have somehow been drawn into the trap still gave him the shakes.

"Dr. Janecki'll take care of most of that," Sands assured him. "She's got a whole row of psychologists and brain specialists lined up ready to go to work."

Behind them the door opened, and a nurse looked in. "Dr. Sommer?" she said, an odd expression on her face. "There's a group of reporters down in the lobby who want to talk to you."

Sommer cocked an eyebrow at Sands, got a puzzled shrug in return. "Not me," she said. "Maybe Janecki or the parents called them."

"Jumped the gun a little, didn't they?" he grunted. Still, since it *had* worked out all right— "I'll be right down," he told the nurse. She nodded and disappeared, and he got to his feet. "You want to come down and get flashbulbed to death?" he asked Sands.

She made a face. "I'll pass, thanks. If it's all the same to you, I'd rather go back to the lab and start debriefing the trap readings."

"Yes, well, be sure and leave both traps running," he warned her, digging out his comb and wishing he'd taken the time to shower earlier. "Those neuropreservatives could still drive Danny into shock, and after all this we sure don't want to lose him in the extra innings."

"Right," Sands nodded. "I'll just pull the packs and leave everything else intact." Her lip twitched in a mischievous smile. "You'd better get down there and give them their lead story—and be sure to save something for your Nobel acceptance speech, OK?"

He stuck his tongue out at her, gave her hand a final squeeze, and left the room.

The nurse had, if anything, strayed on the conservative side: the mass of reporters resembled a mob more than they did a simple group. A dozen minicams swiveled toward him like gun barrels as he entered the lobby; twice that number of directional microphones were right behind them. Sommer stepped to more or less the focus of the semicircle, raised a hand for silence—

"Dr. Sommer," a voice called, "how do you respond to the allegations made this morning by Senator Barnswell's attorneys that you have proved the ex-

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istence of the human soul and of distinct racial differences in that soul?"

For a long moment Sommer just stood there, hand still raised, as the universe seemed to gently tilt around him. Barnswell; Sands's secret sale of their Mullner-trace data to him—the work of the past two weeks had completely driven it from his mind. "Ah—yes," he managed to last. "It was my understanding that Senator Barnswell would discuss any implications of our work before he released it."

"Do you confirm his results, then?" someone else asked, clearly uninterested in anything as common and unnewsworthy as betrayed trust.

"I confirm that our work has proved the existence of a human soul—or a life-force, if you prefer," he added, remembering Sands's own reluctance to use the more theologically-loaded term. "But as to whatever these racial implications are that he thinks he's found, I would say they are at the very least exceedingly premature, and more likely a whole-cloth fabrication of his followers' prejudices."

"*Are* there, then, different types of souls?" someone pounced.

Sommer gritted his teeth. "There are differences in souls, certainly," he said. "Each one of us is a distinct individual—how on earth could our souls not be different? Again, though, there is absolutely no evidence at this point that there are any significant differences between racial or ethnic groups."

"Dr. Sommer, it sounds as if you haven't actually seen Senator Barnswell's conclusions yet. Is that true?"

"It is," Sommer nodded.

"May I ask, then, how you can dismiss them out of hand?"

"Simple." He glanced around the battery of minicams, a small fraction of his mind wondering just how Barnswell was going to take this. "As I said, Senator Barnswell's representatives promised not to release our data without our permission. To make sure he didn't go back on that promise—" he took a deep breath— "I took the liberty of scrambling the personal profiles and Mullner traces of our subjects. Whatever patterns the Senator's people think they see, therefore, simply don't exist."

There was a moment of stunned silence. Then, the whole mob seemed to explode at once into a blizzard of shouted questions. Once again Sommer held up his hand; eventually, the wordstorm dwindled and died. "Ladies and gentlemen, as far as I'm concerned, Senator Barnswell and his theories are old news, and not very interesting news, at that.

"Now, if you're interested in a *real* story. . . ."

It was, he thought more than once during that long day, as if he'd dropped a tactical nuke into the middle of the news industry. The shock wave of his announcement utterly shattered their neatly prepared list of events and stories to be covered, sending them scrambling for background and interviews and commentary. By early afternoon the shock wave had reached the political arena, prompting instant speeches from both ends of Pennsylvania Avenue and assorted foreign capitals. And as afternoon shaded into evening the wave jolted the nation's religious leaders into

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statements of their own, ranging from reflexive denunciation on one extreme to cautious wait-and-see acceptance on the other.

Most of the sound and fury Sommer got only second hand, mainly in the form of references within the never-ending stream of questions thrown at him by successive shifts of media people. Local media interviews, long-distance phone calls from the international news services, live network interviews on the evening news, late-evening commentary programs—he was put through the entire gauntlet. Occasionally he was asked about Barnswell, but it was clear that the Senator's big bombshell announcement had been completely lost in the glare of the Soulminder story, and by the evening commentary shows all such questions had disappeared.

Finally, just after midnight, it was over.

"Is that it?" Sommer asked as the red light on the camera went out and the monitor showing his face went blank.

"That's it, Doctor," the station manager nodded, stepping forward to help him unfasten the mike from his coat. "*Nightline* was the last one on your schedule."

"*Your* schedule, you mean," Sommer reminded him wearily. "None of this was *my* idea, if you recall."

The other smiled. "You should have thought of that before you became famous," he joked. "Anyway, the morning programs start at six—"

"Do me a favor and tell them I died overnight, will you?" Sommer told him, digging his knuckles into his eyes. "Death by overexposure, or something."

The manager chuckled. "Don't worry about it, Doctor—everyone's got enough of you on tape to cover half a dozen programs if they have to. Not to mention a hundred people standing in line to comment on your discovery. You have a car here?"

Sommer shook his head. "I left it back at the hospital. Probably got fifteen parking tickets on it by now."

"No problem." The other caught the eye of one of the security guards, beckoned him over. "Blake, Dr. Sommer needs a ride home. Make sure he gets there all right, and fend off any late-night vultures and paparazzi, OK?"

"Sure, Mr. Hardin," the guard said genially. "My car's out front, Dr. Sommer."

Sommer swallowed as the other led the way through the maze of cameras and cables and lights. The thought that reporters and commando photographers might be lurking in wait for him at all hours was one that hadn't occurred to him before, and it sent an unpleasant chill down his back. To lose all chance of a private life in a single day—

No, he told himself firmly. *It's just a temporary notoriety. That's all. Nothing that'll last past the end of the month.*

Still, he felt his stomach tensing as he and Blake headed across the lobby toward the big glass doors. No one was visible, but there were lots of places out of view where the paparazzi could be hiding. They stepped out into the cool night air. . . .

No flash bulbs went off; no one jumped from behind the low shrubs shouting questions.

"This way, Dr. Sommer," Blake

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said, leading the way across the circle drive toward the front parking lot.

Sommer followed, feeling relief and, paradoxically, a faint stirring of disappointment. He scowled at the latter; he was not—was *not*—going to be one of those who became addicted to fame—

He'd reached the middle of the circle drive when, fifty feet away, a pickup truck suddenly lunged away from the curb and headed toward him.

He paused, feeling his emotions remix themselves. So there *had* been a reporter lying in wait for him. . . .

And with fatigue and resentment dimming his brain, it was another second before it registered that the truck wasn't slowing down. Was, in fact, still accelerating.

Directly toward him.

He tried to run; but it was far too late for that. Dimly, through the sudden rush of blood in his ears, he could hear Blake's shouts as the other sprinted back in a futile attempt to help him . . . could hear the screams of the driver, slurred and angry and obscene . . .

Could feel the awful impact as the truck rammed into him, sending him hurling into darkness.

He seemed to be in a long tunnel, a tunnel that glowed with a dim but uniform light. For a moment he wondered where he was; and then he remembered. The truck, the impact, the darkness.

And it occurred to him that he was dead.

Dead.

For a moment he studied the word, and the concept behind it, waiting for the inevitable emotional reaction to hit him. To his mild surprise, none came. Apathy, he thought at first, or perhaps a completely mind-numbing despair; but it was obvious that neither label even came close to describing how he felt. It was, he decided, more like a deep and restful peace, one that permeated his being so thoroughly that it filled every corner, leaving no visible edges by which it could be defined or even really noticed without a deliberate effort to do so.

Ahead—a long way ahead, so it seemed, though he could sense that distance didn't really have much meaning here—he could see the end of the tunnel he was traveling through. Beyond it was a bright light; bright, yet not in any way hurtful . . . and it was from the light, he suddenly understood, that the sense of peace radiated. He willed himself forward; in response, though there was no sensation of movement, the tunnel walls increased their silent speed past him.

So gradually that he didn't notice at first, the movement of the walls slowed. Slowed, and then stopped.

There was no way to tell how long he waited there, hovering motionlessly in the center of the tunnel—time, like distance, seemed to have lost all of its meaning. Ahead, the light beckoned to him; not insistently, like a siren being deprived of her victim, but like a friend, waiting with patience for him to finish the journey. Once, he tried explaining that the delay wasn't his doing, but even as he searched for a way to make himself heard at so great a distance he could sense that the light already understood what had happened.

By the time the walls again began to move, Sommer understood, too . . . and

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so it was with no surprise at all that he found the walls were moving in the wrong direction. The light faded as he moved, disappeared entirely—

And abruptly pain flooded in on him.

He gasped, feeling the sensation of inrushing air as almost something alien. A blinding stab of fresh pain lanced through his chest as he did so—

"Adrian!" a familiar voice almost barked in his ear. "Take it easy, Adrian, it's all right. You're here. You're safe."

His eyelids were heavy, but with a supreme effort of will he pried them open. Sands was leaning over him; behind her an unfamiliar face frowned at something outside his field of view. "Heartbeat looks good," the man said. "He's breathing on his own." He peered at Sommer as if at a laboratory specimen. "I wouldn't have believed it if I hadn't seen it."

Sands threw him an irritated glance before turning back to Sommer. "How do you feel?" she asked. "Can you talk?"

Sommer worked saliva into his mouth. "How . . . long?" he croaked.

She understood. "That drunken idiot ran you down six days ago," she told him, eyes flashing with anger. "One of Barnswell's more brainless supporters, I gather, who didn't much like you making a fool out of his idol on international television."

"How's Danny?" The words came out easier this time.

"Making a rapid recovery," Sands said, and there was no mistaking the satisfaction in her voice. "Dr. Janecki says that aside from an occasional moody thoughtfulness there doesn't seem to be any aftereffects at all from his stay in Soulminder."

Sommer thought about his own experience, and about the Light. "Maybe wishes he hadn't been brought back," he murmured.

Sands's forehead furrowed for a moment. "Yes, well, I'm sure that'll pass," she said. "Janecki also says that because of Soulminder they were able to get nearly the entire tumor out. She figures that a couple of months of chemical treatments ought to clean out any residue, and that'll be the end of it." Her lips twitched in a smile. "I don't know about you, but I think that's a pretty good memorial for your son. Wouldn't you say?"

Sommer closed his eyes. A fog was rolling in over his consciousness. . . . "Yes. It's finished now."

He heard Sands's hesitation, felt her hand reach out to squeeze his carefully. "You'd better get some rest," her voice came distantly. "We've still got the lab's trap running, so there's no danger we'll lose you. You're pretty lucky it was still doing that complete file scan when you got run over."

"Lucky," he echoed, his own voice sounding even more distant than hers did. His last thought before he fell asleep was of the tunnel . . . and of the Light.

It was another two weeks before they would let him return to work. To work . . . but not to his lab.

"Well, what do you think?" Sands asked, gesturing proudly around her.

Sommer stared at the huge room, the gleaming instruments laid out on long and uncluttered lab tables. "It looks like

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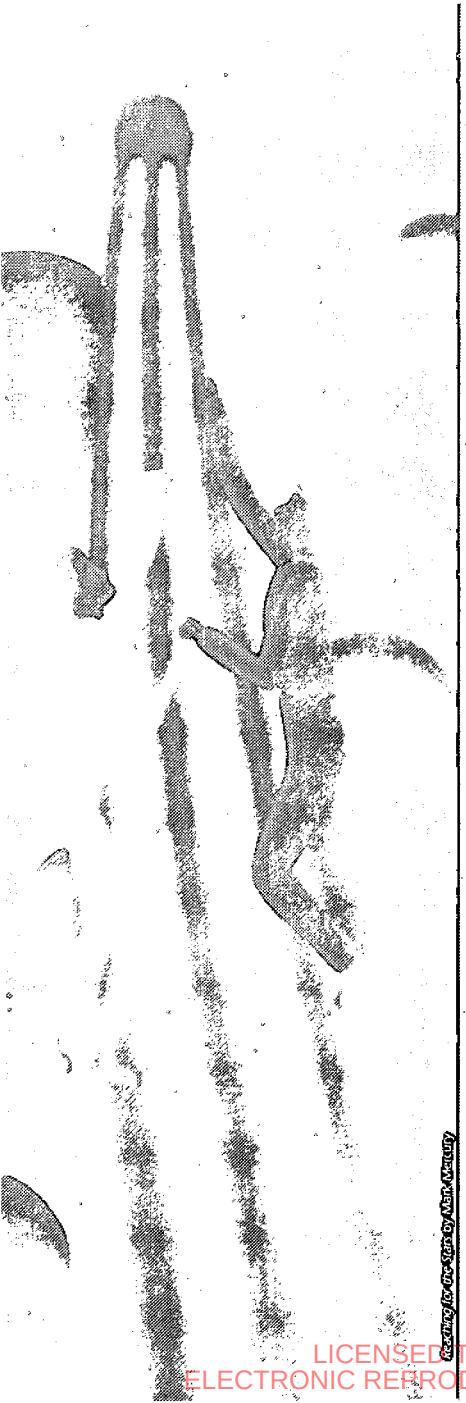

Reaching for the Stars by Alan Murray

FOR THOSE WHO STILL DARE TO DREAM

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a Hollywood movie set," he growled, an uncomfortable feeling beginning to gnaw at the pit of his stomach. "May I ask just who is footing the bill for all this?"

She waved her hand. "Oh, we've got backers coming out of our ears now. Everyone from basic electronics people like Hewlett-Packard—that stuff over there's from them—all the way up to good old Uncle Sam himself."

Sommer grimaced. "Oh, great. The government. How to screw something up, in one easy lesson."

She gave him an odd look. "Maybe you haven't got it yet, Adrian. No one's moving in to take over—the only thing Washington's concerned with at the moment is renting a set of Soulminder units to protect top government officials. *We* are the ones in the driver's seat, and that's the way it's damn well going to stay."

Sommer shook his head, the movement sparking a twinge from his neck. "It won't last, you know," he reminded her. "The minute you apply for a patent on the trap there'll be a hundred copycats making their own versions."

"Which is why there won't *be* any patents," she told him. "We'll put our money into keeping the Soulminder design and process a complete, black-hole secret. It shouldn't be all that hard—thanks to you, we now know that Soulminder can handle a subject from at least ten miles away. We'll be able to keep everything of value safely locked away in our own buildings, with our own security web around them."

Sommer nodded tiredly. "Well, I wish you luck with it. Just make sure—"

"Whoa," she frowned. "What's this 'you' stuff? We're both in this together, you know."

He shook his head. "No, I don't think so, Jessica. I've done everything I set out to do—Soulminder exists, it works, and according to you, it has a good chance of surviving. It's over now."

She snorted. "Hardly. There's a tremendous amount of work yet to be done. Research on better neuropreservatives, regrowth of damaged tissue, bioengineered organs and limbs—maybe even entire replacement bodies—"

"Wait a minute," he interrupted her. "What on earth are you going on about?"

She took a deep breath, eyes blazing into his with a dark fire he'd never seen there before. Or perhaps only never noticed. "You see Soulminder as a holding tank for critical patients," she said quietly. "I see it as mankind's ticket to immortality. *My* ticket to immortality."

For a moment he stared at her. To have worked with her for three years, without ever recognizing what it was that was driving her. . . . "That's not realistic, Jessica," he said gently. "Death is a part of life—"

"So was smallpox, once," she said tartly. "I've heard all those arguments, Adrian. Every one of them is either nonsense or rationalization."

"Death is a part of life," he repeated, louder this time. "It's as much a passage to what lies beyond as your birth was a passage into *this* world."

She snorted, a sound that was at the same time contemptuous and oddly nervous. "What lies beyond. You mean all that stuff about tunnels, do you, and bright lights and passages and friendly voices?"

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"Why not?" he demanded, even as her tone made him wince. "Don't forget that I was there. I *saw* it."

"Saw *what?*" she retorted. "Something real, or something totally imaginary? Can you *prove* it wasn't a psychovisual reaction or a forced memory of birth or even a side effect of Soulminder itself? Come on, Adrian—you know that a mind in that state can't be trusted."

He swallowed, gazing into her eyes. Hostile eyes; eyes that showed she had already made up her mind. "It's your life, Jessica," he sighed at last. "If you want to spend it chasing a rainbow, that's your business. But count me out."

Something in her face changed. "I'm sorry . . . but I can't."

"Jessica, I don't *want* to be immortal."

"I know." She pursed her lips, and a flicker of pain crossed her face. "But for the moment . . . I can't let you have that choice."

He stared at her, something cold running straight through him. "I don't understand," he said carefully. "Are you trying to say that my Mullner pattern can't be erased from Soulminder's files?"

"I'm saying," she said quietly, "that your pattern *won't* be erased from the files."

He just looked at her, and after a moment she sighed. "I can't let you die, Adrian," she said, the words coming out with difficulty. "All this medical research is going to cost money—*lots* of money. I need Soulminder to be as big and as powerful and as rich as it can possibly be . . . and you're the key to that. *You*—Dr. Adrian Sommer—are the symbol of Soulminder. The man they couldn't kill; the man whose resurrection machine has fired imaginations all over the world." She took a deep breath. "The only man who can keep those imaginations fired."

"That's crazy," he breathed.

"Yes, it is," she admitted, an odd weariness in her voice. "But it's happened. And until Soulminder is firmly on its feet, I have no choice but to take advantage of it."

"And if I refuse to be Soulminder's mascot?"

Her eyes were almost pleading. Almost; but not quite. "Soulminder is your child, Adrian, as much as David ever was. You can't turn your back on it—who knows what kind of monster it might become without you?"

He looked her square in the eyes. Jessica Sands, once his co-worker . . . now with literally the power of life and death over him.

The power of life *without* death. "I think," he said quietly, "that it's already becoming that monster."

She winced, but remained silent, and after a moment he turned away. A hundred small lights flickered at him as he did so, reflected from the gleaming new instruments surrounding him. *What is a man profited,* he quoted tiredly to himself, *if he shall gain the whole world, and lose his own soul?*

He had no answer to that. But one way or another, it looked as if he was going to find out. ■

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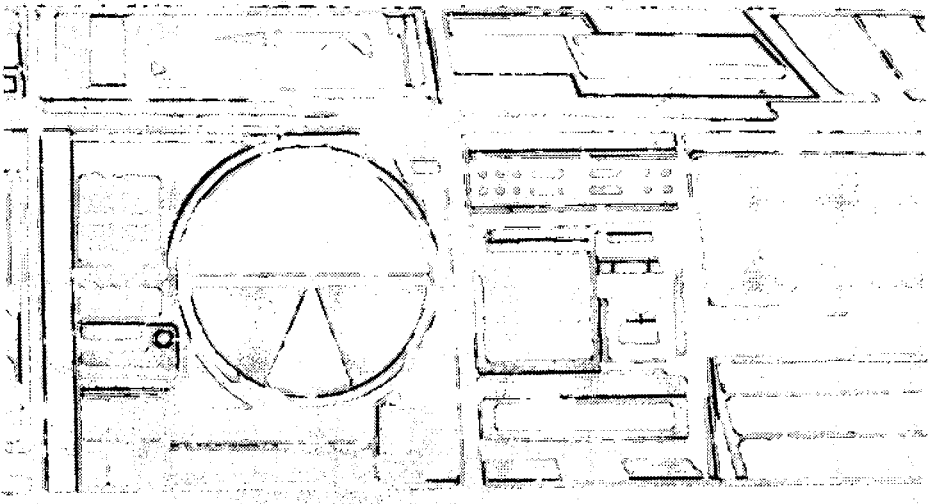
TESTING, 1, 2, 3 . . .

L. A. Taylor

An important part of research and development is testing—and when the systems being tested get sophisticated enough, the methods may become a bit strange!



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He couldn't say he hadn't been warned.

One of the engineers, Hansen or Krzywicki—he couldn't remember which, and that bothered him enough to be reportable—had remarked just as he left, "You know, Collins, she's getting a little slow of speech, lately."

That was the hands-down winner for understatement of the year. But Oracle #4 was the only one with the information he needed to pass his test, so Collins cocked his head and concentrated on the slow syllables spun out endlessly, teeth clenched except when he repeated the sounds, faster, to make words of them. The spurt of anger when he realized that her first word was only "hello" startled and frightened him.

Collins stared at the robot. He had actually wanted to beat this elderly machine with his fists, to make her go faster! Surely you'd know better, he chided himself. The rule was unspoken, but inviolable: one did not attack other beings, not even malfunctioning robots.

The word "now" took at least half a minute.

His ribs were pumping faster now. Must be—what was that word? Adrenalin, yeah. That's what makes hearts beat faster, lungs breathe harder.

One of them, Krzywicki or Hansen, had told him that. Again, Collins couldn't remember which. Not being able to remember made him wonder if his own mind might be wearing out, like this metallic bulk grinding out the word "is" over another quarter-minute. Scary.

Collins reined in his breath: he didn't know how else to think of it. Slowed the motion of his chest, made the fists on his knees relax, remembered the message as he needed to pass this test. Writing was forbidden. "Now is the . . ." she had said. What was this next sound? A plosive? Yes, but which one? Well, he'd make sense of the word as it went along.

A minute later, he had it. "Now is the time." Again, the ribs began to buck. *Now* is the time! A true prediction? Or only part of the test?

Oracle #4 ground to a stop. Her lights flickered out. Gently, infinitely tenderly, Collins fingered the buttons to reactivate her, hoping she'd begin where she left off.

A long, sighing aspirate.

His spirits sank. She was starting at the beginning, at the ten-minute-long "hello." His hands gripped his knees. He looked down at the resilient flesh pressed out around his pink-backed fingernails and willed control. The one thing he must not do was give way to this—this adrenalin surge. An unspoken rule, but an inviolable one. Collins stared bleakly at Oracle #4. How long must he sit here, waiting out that message, the one he *must* reconstruct from her mumblings, in order to pass this test?

How long? Four hours. Collins was reasonably sure Oracle #4 had delivered her whole message, and pleased with himself for not giving way to the terrifying urge to kick the machine, pound his fists on the keys, drive a heel into one of those blind lights that stood for eyes. That, he had decided, must be the point of this undefined test: to understand the message without showing any sign of impatience. And he had done it. Collins returned to the laboratory, where Hansen was tossing jujubes

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into the air and scooting around on his chair to catch them in his mouth while Krzywicki penciled notes on the margins of the top sheet of a mound of paper.

Krzywicki looked up. "Did you get the message?"

"Yes, sir." Collins lifted his chin with what he thought justifiable pride. "I think it may be important, too, sir. She worked so hard to convey it. It's 'now is the time for all good men to come to the aid of the party,' sir."

"Oh?" Krzywicki tapped the end of the pencil against his chin. "Nothing about foxes and dogs?"

"No, sir." Collins felt a wash of disappointment. Had he been too impatient, after all?

"She didn't mention a man called Shrdlu?"

"No, sir."

"Or refer to Betty Botter's butter?"

"No, sir. May I ask, are these conspirators of some sort?"

"Not if she didn't mention them." Krzywicki stared at him for a moment. "Take a rest, Collins."

Hansen stopped tossing jujubes into the air and watched as Collins walked stiffly to a bench at the side of the room, sat down, and turned off with an audible click. "Damn," Hansen said. "He almost made it."

"Almost! What do you mean, almost?" Krzywicki yanked at the mound of paper, sending half of it to the floor, and shook the remaining pages in Hansen's face. "Look at these monitor readings! He almost blew a fuse! All our fuses!"

"So?"

"So we've got a robot with human emotions, right?"

"Look." Hansen opened a drawer and put the last of the candy away. "Did the professor stipulate a criterion for success, or not?"

Kryzwicki threw up his hands. "He did."

"Collins had to attack the machine, right? And did he? No. He didn't kick her, pound the keys, shake the console, anything like that, now, did he?"

"No." Krzywicki's shoulders sagged.

"And only if a robot can be built that will do that will the professor be able to test his equipment without endangering real men, right?"

Krzywicki rolled his eyes. "That's what he says."

"So. It's back to the drawing board for us peons, right?" Hansen was all sweet reason. "Keep going along the lines the professor laid out until we get it right, right?"

"Oh, *hell!*" Krzywicki bounced out of his chair and kicked the robot codenamed Collins in the knee with all the force he could muster. The body snapped back; the head dented the concrete wall. Krzywicki grabbed Collins by the shoulders and started shaking it.

"Take a rest, now, Krzywicki." Hansen watched Krzywicki sit on the bench next to Collins and click off. Uncanny, how much alike they looked, despite the differences in hair color and eye color, now that both were blank and rigid.

Nodding, Hansen picked up the phone and punched a few buttons. "Professor?" he said. "I've got a live one here."

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"Great," came the reply. "Which one is it?"

"It's Krzywicki, sir."

"Excellent, excellent." The voice at the other end of the line was rich with pleasure. "Just as I expected. Are the jujubes put away, Hansen?"

"Not yet, Professor."

"Very good, Hansen. You've turned out to be quite useful, after all. I'll be over in a few minutes to look at the monitor records. Put the jujubes away—I don't want them rattling around in there. Then take a rest."

"Yes, sir." Hansen hung up. He unbuttoned the middle two buttons of his shirt, reached into his chest for the plastic bag of slightly-mashed jujubes, and removed it. He left the bag on the desk, went over to the bench, moved Collins and Krzywicki aside to make room for himself, sat down, and clicked. ■

IN TIMES TO COME

Given a matter transmission system capable of operating over interstellar distances, interstellar empire might seem inevitable—but not necessarily simple. In particular, a matter transmitter that transmits only *matter* is not very useful for phone calls, so people in one part of the empire wanting to talk to people in another would presumably be reduced to sending messages as hard copy, much as American colonists in the eighteenth century got word to and from King George. The future empire would, of course, have the advantage of improved technology so that such messages could travel unaccompanied—but what do you do when one goes astray, without witnesses? That's the situation in our February cover story, Cordell Scotten's "The Hijacking of the Pony Express," and in this case solving that mystery leads to a bigger one. Contact with aliens can be complicated too, you know, particularly when the aliens themselves are more complex than anyone has previously suspected. . . .

We'll also have novelettes by W. R. Thompson and Paula Robinson; short stories by Jerry Oltion, Michael F. Flynn, and others; and a fact article by Stephen L. Gillett, Ph.D. on "The Government, the Frontier, and Space." There has been a good deal of controversy over the roles private enterprise and government should play in the development of the high frontier, but this is not by any means the first frontier human beings have dealt with. Looking at how things have worked on earlier frontiers should bring some historical perspective to the whole discussion.

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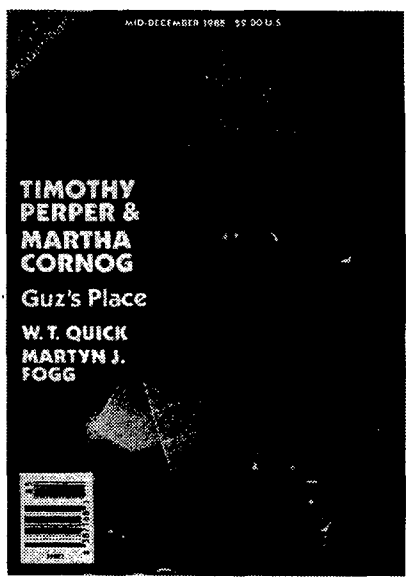

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Marc Stiegler

HYPERMEDIA AND THE SINGULARITY

The shape of things to come may be very different from those you're used to!

-A Child Dying of Adrenoleukodystrophy
-Sanskrit literary style
-Buttons to begin an Article on Hypermedia and the Singularity
-Flight in Information Space
-Definition of Hypermedia
-Road Map
-Definition of Singularity

TO SEE ONE OF THESE SECTIONS, JUST POINT AND CLICK (oops—this is a paper document, not a computer document).

Road Map

This article is about the relationship of the technology of *hypermedia* to the approaching time of technological *Singularity*. There are a lot of ways we could start this discussion; up above, in italics, you see a list of the starting places that I considered before writing. The article, as it now stands, has the following layout:

1) the list of buttons (the section in italics at the beginning of the article),
2) the road map (that's where we are now),
3) a major section to define hypermedia, with sidesteps to consider:
  a. Sanskrit literary style
  b. flight in information space
  c. hypermedia art, and
  d. issues of hyperstyle

This lengthy discussion of hypermedia is followed by:

4) a shorter definition of the Singularity, and
5) a discussion of how the Singularity and hypermedia are interrelated. This discussion of interrelationships wraps up with an example of how hypermedia will accelerate our approach to Singularity: the story of the child with adrenoleukodystrophy.

Finally, the article ends with:

6) a discussion of the next steps in hypermedia development, who is taking those steps, and where it will lead.

Definition Of Hypermedia

Hypermedia is much easier to use than to define. In one sense, you have already seen a definition of hypermedia in the early layout of this article, though in practice it's difficult to grasp without a computer-based example.

Hypermedia is the child of *hypertext*.

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Ted Nelson coined the termed hypertext in the sixties and defined it simply as "nonlinear writing."[1]

Linear writing has been mankind's standard for millennia. One alphabetic character follows another, one word follows the next, building sequential sentences, paragraphs, and chapters. The writer designs his document for a reader who is *trapped:* the writer assumes that the reader only has the ability to go forward one step, or backward one step, but nowhere else.

Of course, we have had limited forms of nonlinear writing mixed in: the table of contents and the index are modern (though primitive) nonlinear writing tools—though slow, they do help the reader skip to the sections of the document of most interest to him.

Sanskrit Literary Style

Nonlinear writing goes back at least as far as Sanskrit. With one of the stylistic approaches used in Sanskrit, the document's opening passage was a series of one-line descriptions of what would follow. The next section contained a paragraph for each one-line description; the next section devoted a chapter to each paragraph description. This design encouraged the reader to skim only as far as he needed to go, reaching into the deep, extensive discussion only as a last resort. The article that you are reading now, with the list of items as its first paragraph, is organized in a way similar to those ancient Sanskrit documents.

Newspapers also encourage nonlinear reading—the headers for the different articles appear in a bolder, larger style, which the human eye can automatically pick out (the powerful perceptual computers behind our eyes that do this automatic selection are a major reason why people find Macintosh-like, icon-oriented software easier to use—using imagery, we can grasp many features without recourse to our conscious reading abilities). After the eye has picked out an interesting article, the first journalistic paragraph summarizes the whole article—only the most in-depth reader must go beyond that first paragraph.

But this is exactly where newspapers fail—the in-depth reader must page back and forth from the front to the far back just to read a whole article.

And while the newspaper frustrates the in-depth reader, the textbook with its index frustrates the skimming reader, who has no real way of perusing just the summaries. The nonlinear extensions to linear books fail because paper is inherently a linear medium. Enter the computer.

Modern desktop and laptop computers have grown powerful enough so that they can give us a truly nonlinear medium for document presentation. No longer must we ask the question "should I set my article up like a newspaper, for skimmers, or should I set it up like a book, for detailed readers?" Set it up for *both*.

With either Guide[2] or Hypercard™[3] (the two widely-accessible hypermedia tools at the time of this writing), the table of contents can be a series of one-line entries that are treated as *buttons:* when the reader points at the entry and

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clicks, the computer brings forth the detailed backup information in the twinkling of an eye. This detailed information can in turn contain other buttons.

Buttons do more than link a brief description with its detailed explanation. Buttons can link multiple, partially related items. A paragraph describing a disease might have a link to a separate paragraph about the cure, which might be linked to a list of related medicines, each of which is linked to a manufacturer, each of which is linked to a list of products, each of which is linked to a list of diseases for which that product is the cure. In this sense hypermedia offers instantaneous references, akin to the suggested reading lists tagged on to encyclopedia articles.

The elements of a hypermedia document do not all have to be text—they can also be pictures, sounds, and full-color videos and animations. For many documents, the table of contents should not be a list of chapter names, it should be a *picture*. A car repair manual, for example, might have a picture of the car as its first item. The mechanic would point to the part of the car he needed to know about, which would give him a closeup view and a short textual description of what it is and how it should work, with a few extra pictures (through other buttons) of typical forms of wear that would call for replacement. The mechanic would zoom in again and again until he found the specific part to replace—and he would then press the button that runs a short video sequence showing how to remove the old part and install the new one (for a simple example of zoom, see Figure 1). With these links interconnecting pictures, text, and video sequences, we have true hyper*media* (for the syntactically finicky, the word "hypermedia" is a singular group noun, unlike the word "media," which is the plural of me-

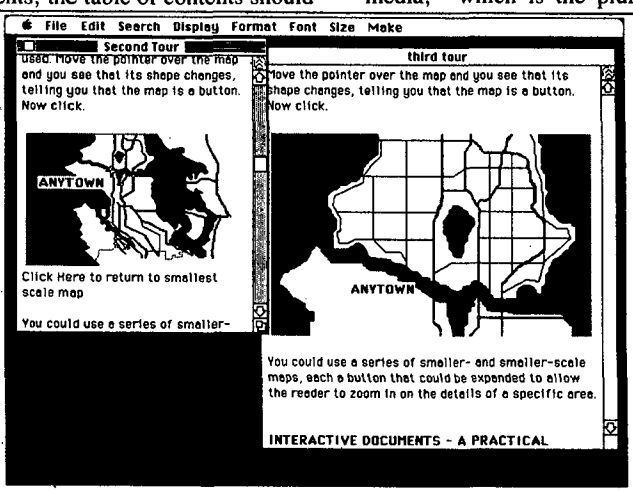
File Edit Search Display Format Font Size Make
Second Tour
used. Move the pointer over the map and you see that its shape changes, telling you that the map is a button. Now click.
ANYTOWN
Click Here to return to smallest scale map
You could use a series of smaller-
third tour
Move the pointer over the map and you see that its shape changes, telling you that the map is a button. Now click.
ANYTOWN
You could use a series of smaller- and smaller-scale maps, each a button that could be expended to allow the reader to zoom in on the details of a specific area.
INTERACTIVE DOCUMENTS - A PRACTICAL

Figure 1. Zooming in on a map. Clicking on the major waterway in the small left-hand map pops the larger, detailed map at right. This shot was taken from the examples supplied with Guide, from Owl International.

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dium).

The links inside a hypermedia database allow the hypermedia reader (a hyperreader?) to leap through a document as quickly as today's linear reader can turn a page.

Indeed, the whole concept of a *document*—a stand-alone volume of text and pictures—becomes less meaningful with hypermedia. As more documents are added to the hypermedia database, with rich crosslinks to other documents, the reader finds himself browsing, not through documents, but through an *information* space. And information space, like normal space, is designed for flight.

Flight In Information Space

I remember witnessing hypermedia for the first time at the Microsoft CD-ROM conference in February of 1987. Owl International was announcing Guide, the first commercial hypermedia system. The presenter pointed at a line in the table of contents, expanded that section to show a list of subsections, and quickly hit four buttons. In an eyeblink, four new windows popped open on the computer screen, each showing a different section of the document, three with pictures. He continued to click, bringing new windows to the fore with new information. I experienced a momentary sense of disorientation. That sensation quickly developed into a sense of breathless movement, of *flight*, the feeling I usually reserve for watching the stars flash past on Star Trek.

With the advent of hypermedia, the quiet but explosive revolution of the "paperless office" draws close at last. The paperless office received much acclaim years ago, but the vision faded as computerization actually *expanded* the creation of paper. This disillusionment with the paperless office came about through a tragic misunderstanding. The vision of the paperless office, however dim, was correct.

When a new technology is introduced, people's natural first reaction is to use the technology to do the same old tasks more quickly. Thus people first used computers to create paper—and they succeeded beyond their wildest nightmares. Computers have dramatically increased paper production—but they have not, by any current measure, increased productivity. This is about to change, and will change with ever greater speed for the next decade as we build tools that make computerized data more effective than paper counterparts.

Hypermedia is a key ingredient for creating that effectiveness (though other ingredients are still necessary to match the merits of paper, namely durability, portability, and resolution; these too will be solved, but that's another article). Once data is put into a hypermedia-based information space, it is easier to retrieve and easier to read than it would be on paper. People will not want to print hypermedia documents: the translations will lose so much value, writers will instead give readers access on the computer. As all the worker's data begins to show up in the same format, interlinked with all the other data so that he can toggle back and forth at the touch of a finger, productivity will start to rise.

Alas, in our modern society, improved productivity no longer guaran-

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tees improved performance. Bureaucrats can always increase the demand for paperwork (or computerwork) to negate any increase in productivity. Technological solutions to more classical problems have not faced such an unbounded obstacle. Not even the government will move a city ten times as far away from you just because your new car goes ten times as fast. Bureaucrats can, however, require ten times as much paperwork once you get there. Consider the effect of our recent tax simplification: it made bestsellers out of thick books about taxes. It seems clear that bureaucrats *will* require even more paperwork.

Hypermedia Art

Besides giving a big boost to the paperless office, hypermedia will give rise to a new form of art to stand beside painting, cinematography, and literature. Indeed, hypermedia may become the culmination of these separate lines of artistic expression, as it weaves the now-disparate genres into a stunning tapestry. In a hypermedia novel, the reader has much more control over which pieces he reads—he might choose to follow a single character through the course of the story one day, and a different character the next. *Winds Of War* by Herman Wouk might be much more readable in this fashion. *David's Sling*, the world's first hypermedia novel, allows the reader to follow not only characters but also subject topics through the period of time chronicled by the story (see Figure 2).[4]

Following multiple character threads

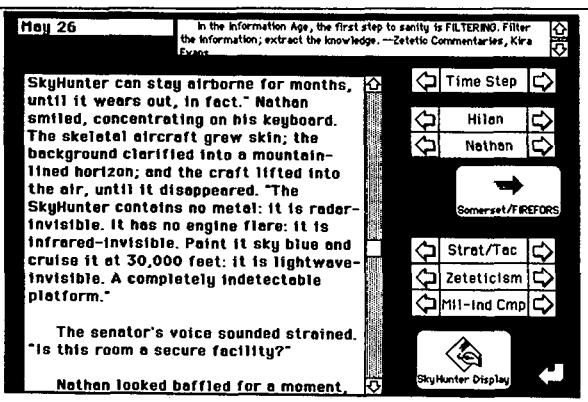
May 26
In the Information Age, the first step to sanity is FILTERING. Filter the information; extract the knowledge. —Zetetic Commentaries, Kira Evans
SkyHunter can stay airborne for months, until it wears out, in fact." Nathan smiled, concentrating on his keyboard. The skeletal aircraft grew skin; the background clarified into a mountain-lined horizon; and the craft lifted into the air, until it disappeared. "The SkyHunter contains no metal: it is radar-invisible. It has no engine flare: it is infrared-invisible. Paint it sky blue and cruise it at 30,000 feet: it is lightwave-invisible. A completely indetectable platform."
The senator's voice sounded strained. "Is this room a secure facility?"
Nathan looked baffled for a moment,
Time Step
Hilan
Nathan
Somerset/FIREFOX
Strat/Tac
Zeteticism
Mil-Ind Cmp
SkyHunter Display

Figure 2. A scene with multiple character threads from the hypermedia novel *David's Sling*. In this scene, Nathan Pilstrom describes the Sling Project to Hilan Forstil. The reader can follow Hilan or Nathan through the story by pressing the left/right (forward/backward) arrow buttons next to their names. By pressing the arrows labeled as Time Steps, the reader can read the story in pure chronological order, following the sequence of scenes found in the paperback version of *David's Sling*. Additional buttons allow the reader to skip to just those scenes that discuss Zetetic philosophy, or to scan discussions of America's military-industrial complex. The "SkyHunter Display" button takes the reader to an animation of the SkyHunter. The animation enacts the sentence, "The skeletal aircraft grew skin; the background clarified into a mountain-lined horizon; and the craft lifted into the air, until it disappeared." This novel was built in Hypercard™, from Apple Computer.

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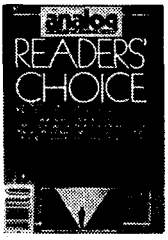

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in this manner opens up even more unusual possibilities. The reader may revel in reading a single scene from several different points of view—Roger Zelazny's *Amber* series offers some interesting hypermedia possibilities in this regard. And the reader would benefit from hypermedia when engaging Heinlein's future histories just because he could finally *find* things.

In SF novels in particular, hypermedia gives the writer a way of sharing his mountains of background material with the interested reader, without imposing on the tight construction of the plot. *David's Sling* has a separate section of Blueprints for those who desire more technical information about the Sling Hunters (see Figure 3). Indeed, in *David's Sling* a reader skilled in the arcane mysticisms of modern management can read the entire story with the Program Evaluation and Review Technique (PERT), in a series of PERT charts (see Figure 4). This is almost certainly the first time that management science has been intentionally used for artistic expression (though from what I have seen, management science is often used unintentionally to create works of fantasy).

Future hypermedia art will require ever more innovative intertwining of graphics with text and animation. The development of truly great hypermedia documents—whether they be pure art, pure information, or a weaving of the two—will require an array of skills that includes illustration, writing, cartoon creation, and cinematography. The most

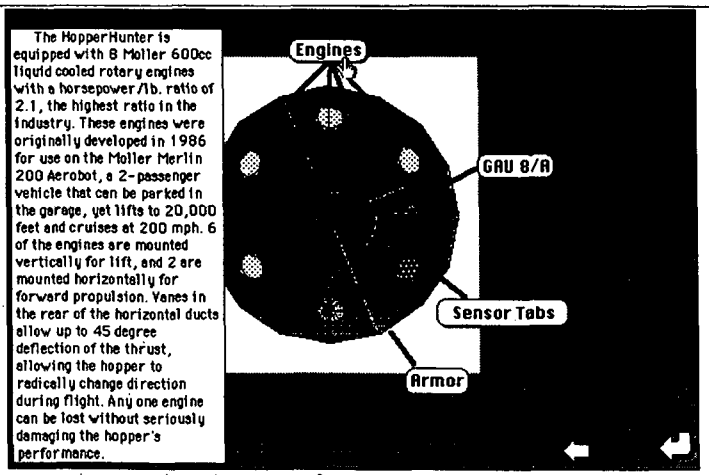
The HopperHunter is equipped with 8 Moller 600cc liquid cooled rotary engines with a horsepower/lb. ratio of 2.1, the highest ratio in the industry. These engines were originally developed in 1986 for use on the Moller Merlin 200 Aerobot, a 2-passenger vehicle that can be parked in the garage, yet lifts to 20,000 feet and cruises at 200 mph. 6 of the engines are mounted vertically for lift, and 2 are mounted horizontally for forward propulsion. Vanes in the rear of the horizontal ducts allow up to 45 degree deflection of the thrust, allowing the hopper to radically change direction during flight. Any one engine can be lost without seriously damaging the hopper's performance.
Engines
GAU 8/A
Sensor Tabs
Armor

Figure 3. Part of the description of the HopperHunter from the Blueprints section of *David's Sling*. When the Engines button is pressed, as it is in this shot (the cursor is denoted by the small hand), an information box pops open to give a textual account of the engine components. In densely packed images, the clutter of the separate buttons could be avoided by making each component of the image "live." Just clicking in different regions of the image would pop information about the region or would zoom in on it. In such active-component pictures one major issue is guaranteeing that the reader recognizes all the buttons; existing conventions for denoting the presence of a button are inadequate.

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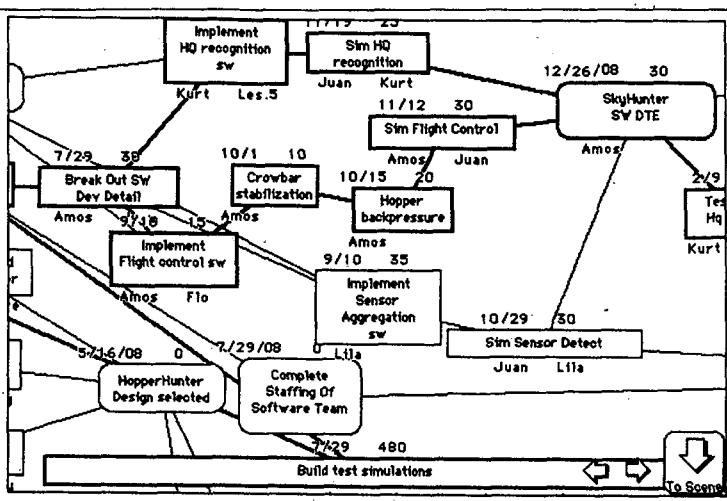

Figure 4. PERT chart view of the middle of the novel. Those familiar with PERT charts will recognize that Amos is a critical resource on the critical path. This dependency has grave consequences in the outcome of the story.

urgently needed skill will be a new one that might best be called *link architecture*: the design of sets of links that offers the reader intuitive flight paths. Whereas modern writers only have to worry about the transition from one paragraph to the next paragraph, the hypermedia author will consider dozens, perhaps even hundreds, of such transitions. Part of skillful design will be to keep the number of transitions, the number of branches, small, while still guaranteeing fast and understandable traversal of the whole document.

Fortunately, these designers will have hypermedia style guidelines on-line to assist them.

Hyperstyle

Some discussion of hyperstyle here may help illuminate the meaning of hypermedia.

Hypermedia designers, just like ordinary writers, would do well to start with the *Elements Of Style* by Strunk and White. As Strunk would say, "Omit needless words. Omit needless words! OMIT NEEDLESS WORDS!"[5]

Items in hypermedia should generally omit even *more* words. In linear literature, one must occasionally summarize terms and ideas from other chapters to guarantee that the reader has the proper context for the current discussion. In hypermedia, however, the author would simply plunk down a button linked to the explanation, leaving the reader the choice of plunging ahead or getting a refresher.

Bold writing, another major thrust of *Elements of Style*, also becomes easier. In linear writing, how can one address complex problems that demand complex analysis? Throughout history,

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speakers who have strived for accuracy have labored at a disadvantage: Men of reason find that true statements require so many qualifiers that their sentences turn to quicksand—and their audiences turn to stone. Meanwhile the short-sighted sloganeer can stir the soul with his quick, simple, wrong answers.

Given hypermedia, reasonable men can make bald, powerful statements, slugging it out slogan for slogan with fanatics—with one telltale difference. Numerous buttons will surround the reasonable man's bold statement, allowing skeptics to branch to more careful supporting arguments.[6] Writers will thus discourse in a way similar to the way we teach physics to children. All of our early education, about little electron and proton spheres whirling around, *is a pack of lies*—but the lies are eminently satisfactory unless you need that deeper understanding, easily achieved in later courses.

This hypermedia approach to bold writing, incidentally, could create a new legal problem if widely used. We might want to consider laws prohibiting the paper printing of hypertext without the author's explicit permission: such printing, which would rip the bold statement from its supporting links, could supply the unscrupulous opponent with the ultimate tool for quoting out of context.

Critics repeatedly cite two fears of hypermedia. First, they fear that you won't be able to find things, i.e., that the information will be "hidden" someplace. A related fear is that you won't be able to find *yourself*, i.e., that you will become lost in the maze of buttons. The sense of disorientation I felt upon first witnessing hypermedia, that sense of "Star Trek Warp Speed," is only pleasant for people on a lighthearted romp; it is catastrophic for people trying to do their work.

The worries about hidden information are probably overblown. There are two causes for this fear. First, one can make legitimate complaints about hidden information in most of today's hypermedia documents. All of today's hypermedia authors are necessarily novices; they are still experimenting with what works and what doesn't. Hiding information behind concealed buttons is cute, fun, and alluring for the beginning writer; but those writers that respect their readers will quickly outgrow the urge to play games. Hidden buttons may have a place in hypermysteries, but nowhere else.

The second cause of hidden information phobia is that people compare hypermedia to a hypothetical *perfect* system, rather than to an everyday *paper* system. Even with hypermedia assistance you'll occasionally lose items. You'll know that a critical datum resides *somewhere* in that information space, but you'll know you'll never find it.

But you'll find it more often in information space than in paper space. In my office, with two huge filing cabinets bursting with linear paper, information loss occurs *every day* (my file cabinets are organized a lot like Heinlein's future history). If I could reduce the loss rate to once a month, it would transform my life (of course, people who organize their file cabinets more carefully have fewer problems in paper space. But people who arrange their buttons more care-

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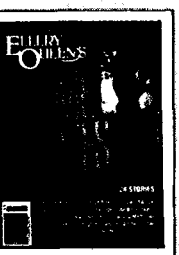

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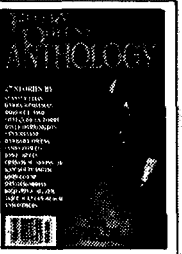

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fully will also have fewer problems in information space; they will literally retrieve items in the blink of an eye).

The other oft-cited fear, of losing *yourself*, is considerably more serious. Disorientation is virtually universal for people encountering a hypermedia document for the first time. A key to successful hypermedia construction will be the creation of the *road map* that shows the reader how the pieces are interconnected. The road map will be the visual presentation of the link architecture mentioned earlier. A sample road map can be seen in Figure 5.

Novices in hypermedia design often predict that the road mapping problem will be solved automatically, that future hypermedia presentation systems will magically build the maps themselves. After all, the computer knows where all the links are, why not let the computer build a composite picture of them all? Of course, the computer *can* build such a picture, and automatic map-building will supply a useful tool to the developer of an information space. But there are thousands of possible map designs for a given information space, based on different graphic arrangements of the objects in the database. Only a human being with a talent for extracting order from chaos can draw an *understandable* map, with subject-oriented symbology, with straight paths for the "main highways" that readers will often take, and with meandering branches for the links that are less traveled.

In large information spaces, the maps themselves will have maps showing

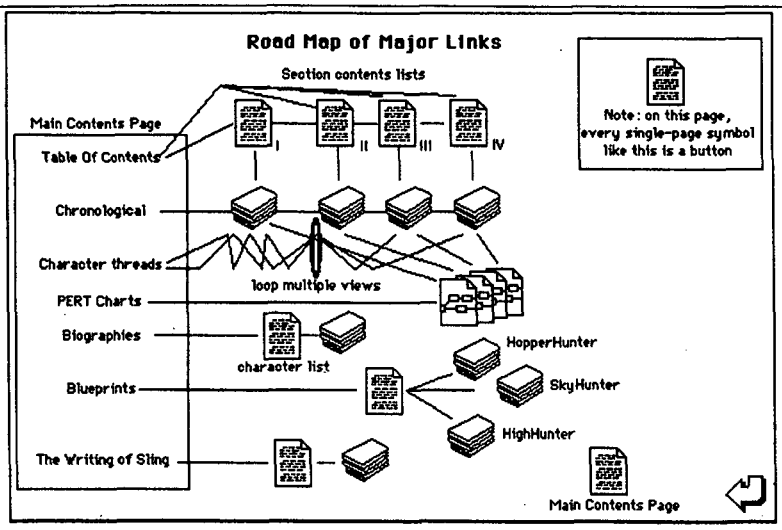

Figure 5. A hypermedia Road Map. The Note in the upper right-hand corner alerts the reader to the presence of buttons he might otherwise not recognize; these buttons support "teleportation," in that you can leap to other parts of the document through the map itself. The design of effective maps is a fine art that will see much evolution in the coming years.

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their interconnections, in a manner analogous to maps in an ordinary atlas. The best road maps will never be more than one button away, no matter where you are in the information space. They will always have a small dot inside, showing YOU ARE HERE. And these maps, unlike ordinary geographic maps, will support *teleportation*—if you see a place you'd like to go, just point, click, and prepare for landing.

These map buttons, and all the buttons binding the information space together, will give the reader unprecedented control over his own exploration. Because the reader will have choices of what to read next, hypermedia literature will be *interactive* in a way that no current form of art can equal (with the exception of computer games, which have not yet been recognized as art).

Earlier, I mentioned an analogy between hypermedia links and the suggested reading lists in the encyclopedia. Anyone who has run such a series of links knows that it can be fun, even with slow, finger-based indexing. But it can also be frustrating. Hypermedia will bring the fun back into learning again.

Definition Of Singularity

I hope I've succeeded in defining hypermedia. Our next topic, as you may recall from the road map at the beginning of this article, is the technological Singularity.

"Singularity" is the term first used by Vernor Vinge[7] to describe the result of an exponential increase in technological sophistication. As the rate of technological advance rises beyond the point where normal human beings can comprehend it, mankind will encounter problems and solutions that cannot even be understood, much less described, in today's context. The people who enter the epoch of the Singularity will find all their material needs fulfilled. They will also be effectively immortal. Looking back from their present, they will consider the concerns of our generation (such as wars, environmental pollution, and bureaucracies) to be appalling yet quaint, just as we might view the concerns of stone-age hunters. By analogy, we, today, can understand the problems beyond Singularity to the same extent as the prehistoric hunter can understand our problems: how would you explain the idea of "cutting red tape" to a Cro-Magnon?

Those of you who have been reading *Analog*'s editorials and fact articles have encountered the idea of Singularity several times. One of the transformational upcoming developments is nanotechnology. With trillions of self-replicating nanorobots scattered through the solar system, we can build machines and products sufficient to fulfill all imaginable material desires (though we will surely imagine outrageous new material desires once nanotechnology starts pouring forth this cornucopia).

Alas, there's one little problem: there are limits to growth in the rate of improvement in technology. People who predict exponential growth for systems are almost always wrong. In practice, systems tend to follow S curves: after a period of exponential growth, some limiting factor intercedes and constricts the growth to asymptotically approach an upper bound (See Figure 6).

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For technological progress, the limiting factor is the human mind. As the velocity of change increases, we humans, who are developing that technology, spend increasingly more time just learning recent technology, leaving us less time to create even better technology (I myself read 20 or more magazines a month, but I churn out about four articles a year). As the complexity of the tasks increases, there will be fewer of us who can understand it well enough to make the next improvement.

A nanotechnology spaceship factory will require the careful orchestration of thousands of *kinds* of nanorobots in a harmonious collusion. This problem is tantamount to building a complete ecosystem of organisms, with the constraint that the ecosystem not only sustain itself but also create a complex machine. Who among us—what thousand-man team among us—has the requisite set of skills to set up this extraordinary symphony?

We know the answer in a vague way. "Computers," we wave our hands, "will augment our minds in constructing these systems." Yes, they will—but how? Word processors won't make the difference. Not even the sophisticated simulation tools used to design aircraft today can make the whole difference—we need to be able to design something worth simulating before we can check it out.

* * *

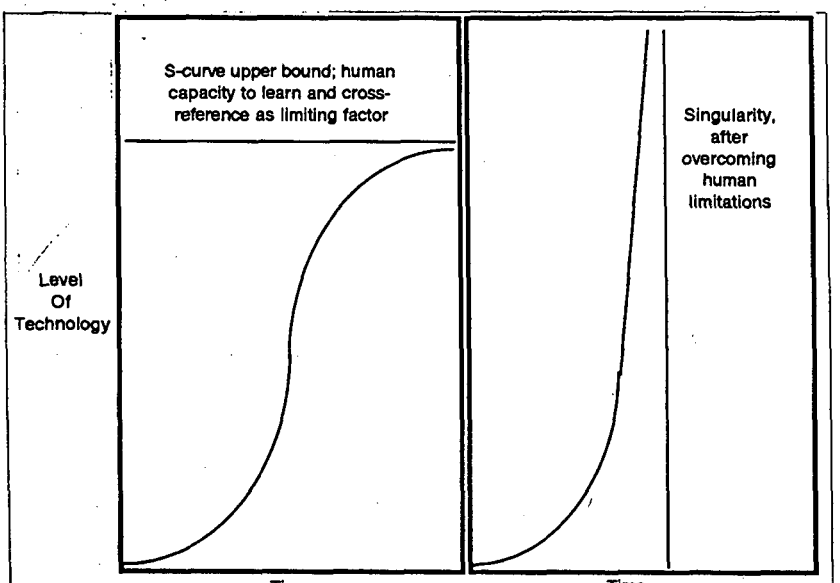
S-curve upper bound; human capacity to learn and cross-reference as limiting factor
Singularity, after overcoming human limitations
Level Of Technology
Time
Time

Figure 6. Exponentially growing systems generally encounter a limiting factor that tapers down the exponential behavior, causing the system growth to actually follow an S curve. Even if we overcome human limitations, the level of technology will eventually hit some kind of limiting factor—but not till long after we have altered our capabilities beyond current comprehension.

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Relationship Of Hypermedia and Singularity

Hypermedia is part of the answer. Hypermedia will give us an indexing system that is over a hundred times faster than traditional indexes such as tables of contents.

That suddenly sounds mundane: how big a deal is it to have an indexing system that is 100 times faster? Indexing, after all, is such a dull chore—of course it is, because it is so important to so many different activities.

Is doing the same old thing 100 times faster a big deal? Let me propose the Magnitude Theorem, about the consequences of orders of magnitude of change: If a process becomes ten times faster or ten times cheaper or ten times better, it is *not* the same process. If a process becomes 100 times better, it is no longer even *recognizable*. Airplanes are rarely thought of as horses that are 100 times faster. We can best demonstrate the meaning of the Magnitude Theorem with respect to hypermedia indexing with an example.

A Child Dying Of Adrenoleukodystrophy

In November, 1987, *Newsweek* ran an article about a heroic couple. Their child had a very rare disease, adrenoleukodystrophy, known as ALD. The disease was characterized by the accumulation in the blood of very long-chain saturated fatty acids, known as VLCFAs. The VLCFAs attacked the nervous system, leading to death in a few years.

ALD had no known cure; the doctors threw up their hands and went on to assist others whom they knew how to treat. Most parents would have thrown up their hands at that point as well. But this couple did not surrender so easily.

They started their own research, and soon found that the scattered researchers on ALD had never met. So they convened a meeting of all the ALD researchers in the world. None of these men had any solutions either—at least, none that they could implement in less than ten years, using advanced genetic engineering. But one researcher had found, in test tube experiments, that the monounsaturated fat, oleic acid, reduced VLCFA production.

So the couple gave up their jobs to pursue a cure for ALD. Their research became more intense, this time searching for a company that could produce oleic acid in a purified form.

After finding a company that could manufacture oleic acid, after testing it for toxicity, they started giving their son oleic acid. It reduced the levels of VLCFAs—but not enough. The couple realized that, to make further progress, they needed to understand *why* oleic acid helped, so they could develop something even better.

Again, research. With months of effort, including the finding of an article from a Polish medical journal, they developed a theory about oleic acid's success. Comparing and crosslinking accounts of animal experiment successes with the kinds of chemicals used in those experiments, it seemed that *monounsaturated* long-chain fatty acids monopolized the elongation process, blocking production of the toxic *saturated* VLCFAs.

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Research! Now they needed the longest-chain monounsaturate they could identify—the longest one that was not toxic. Erucic acid, from rapeseed oil, was a long chain indeed. But it caused heart disease in animals. More research! Animals, they learned, metabolize erucic acid differently from humans; no heart disease or any other problem in humans had ever been identified.

And research. They had to find a company that could purify the oil sufficiently to make it useful. Again, after a long search, they found one.

When at last they could treat their son with erucic acid, his VLCFA levels dropped to normal in three weeks. Unfortunately, it had taken years for the couple to complete the long search—the long cross-indexing of existing information—to find the cure. Their son was already in a coma. At the time of the writing, it was unclear whether he could recover.

Is it obvious, how hypermedia could have affected this effort? If databases on ALD, biochemistry, molecular structures, chemical manufacturers, and ongoing research activities had been interlinked in a hypermedia information space, the effort that took these people years could have been completed in a few months (See Figure 7 for a picture of a "Hypermall," where future searches for such cures might begin).

Those parents could have saved the life of their child. Even more incredibly, they could have saved the life of their child *cheaply*—without sacrificing their own lives to the effort. Their search for a cure could have been a modest activity, rather than a heroic event.

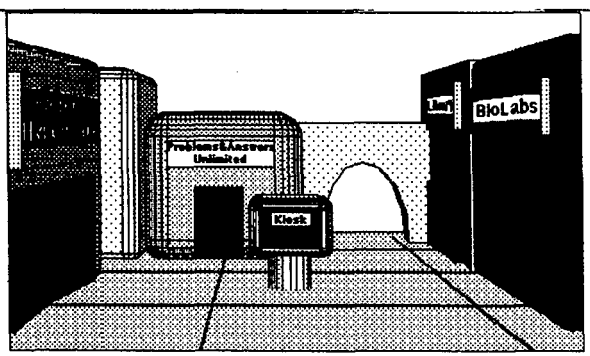

Figure 7. Entrance to a hypermedia "shopping mall." Though 2-dimensional road maps work well for many purposes, 3-dimensional metaphors offer the reader even more intuitive explorations of information space. This demonstration of tomorrow's hypermall was constructed using a 3-D design tool; it literally allows the designer to roam the corridors at will. Entering the Problems&Answers store (by clicking on the entranceway), the reader finds problems tacked on the bulletin board; one of those problems is a request for a cure for ALD. The reader can enter the Library to search for reference material, and use the Bio Labs to conduct experiments. If the reader needs services not available in this mall, he returns to the Problems&Answers store to post his own problems for outside assistance. He might, for example, ask for a chemical company that can refine oleic acid. In this manner the store acts as a connection to electronic networks and bulletin board services. The kiosk, which has a map of the mall, doubles as a teleporter.

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With hypermedia information spaces, this could open up a breathtaking alternative for those of us faced with seemingly insurmountable problems: *if no one else has a cure, OK, I'll invent one! If no one else has a device, OK, I'll invent one!* With hypermedia information spaces at our disposal, our ability to keep up with the technology explosion will itself explode.

Next Steps In Hypermedia Development

Putting all the world's data into an information space would be a huge undertaking—just digitizing it would be an enormous task, and beyond that is the effort of putting in the crosslinks, the hypermedia buttons. Putting the world's knowledge into hypermedia might become the titanic yet vital project for the information age that the transcontinental railroad's development was for the industrial age. Building information space will give us the same increase in speed and power for information movement that the railroads gave us for material goods.

Several organizations are working toward the building of a global information space, albeit slowly. Apple Computer is probably the leader in the use of hypermedia on personal workstations, having introduced Hypercard, the most-raved-about hypermedia product in history. At its first public presentation, it received a standing ovation from the audience.

Both Apple and Microsoft, the two principal drivers of personal computer technology, have made major commitments to the optical storage devices needed to inexpensively store hypermedia databases. At last year's Comdex, Kodak displayed an optical disk juke box that could store half a *terabyte* of information, enough to store a century of *Scientific American*s, 400 times over.

The rise of digital information standards, such as Postscript and SGML, will reduce the agonizing costs now incurred by anyone trying to collect large blocks of data from diverse sources. These standards were not designed as data formats for hypermedia information, but their widespread adoption will nonetheless help by creating a smaller set of formats from which conversion will be necessary.

Researchers at IRIS, the Institute for Research for Information and Scholarship at Brown University, have built curriculum materials for English and biology in their own hypermedia system Intermedia, with more to follow. Key goals include the building of easy-to-use tools for creating information spaces (called webs in Intermedia), and to allow growth of the information spaces without bound[8] (see figure 8).

Perhaps the most visionary hypermedia undertaking is the Xanadu project, started by Ted Nelson (the same Ted Nelson who coined the term hypermedia in the first place)[9]. The Xanadu project is developing a hypertext publishing network capable of interlinking millions of documents for thousands of users. Xanadu is also building several examples of front ends, or user interface software, to this information space for personal computers such as the Macintosh, Amiga, and the IBM PC; their

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long term plan is to support third-party front end developers.

Xanadu incorporates many significant features beyond the basic hypermedia concept. Xanadu will maintain version control of all the documents in its information space. Links to one version of a document are also present in all other versions (as long as any of the linked data is still present). Thus the reader may trace the evolution of a concept. It also allows the original author to update and correct his work, based on the comments and criticisms others have leveled at his document (and which have been attached to his document by later readers).

The basic links in a Xanadu information space are two-way, i.e., when a link is installed, it puts a button at both ends, allowing the reader to go in either direction (which is considerably different from Hypercard and Guide). Thus when an author inserts backward references to earlier works, the system automatically creates *forward* references. This will fulfill the scholar's greatest fantasy, giving him a bibliography that lists not only material that predates an article, but also a bibliography of all the works created *later* (several years ago, *Analog* published a story about a thiotimoline-operated typewriter. This typewriter could print material from the future, offering a similar forward referencing capability; the idea was hysterically funny because it was so self-evidently impossible. I would have added a reference here to the issue of *Analog* that has the story—but the effort to find it is overwhelming, until we get *Analog* into hypermedia).

Xanadu even has a reasonable answer to the question, "How does the author get paid?" The creators of Xanadu database material (and anyone can be a creator here) will receive royalties based on the number of times their material is accessed; the reader will be charged based on the number of kilobytes of data he reads.

Even the Library of Congress is exploring the application of optical media in its quest for self-improvement. Anyone who has ever attempted to use the Library will appreciate their sense of urgency: the card catalog is not a boxful of index card racks, it is a series of rooms, full of boxes full of index card racks. A subject such as "Advertising" sprawls across half a dozen racks. Stoic is the researcher who selects a handful of books from that mammoth collection, necesssarily at random, then waits several hours for retrieval—only to find that these weren't *quite* the books he had in mind.

As information spaces like the Library of Congress get linked up, new commercial enterprises will arise that blend a bit of the editor's role, the publisher's role, and the reviewer's role. How will the average reader separate the wheat from the chaff? Part of the answer will be that respected reviewers and editors will construct link-sets that point out all the documents that *they* thought were excellent.

Other value-added retailers will build unique, cross-pollinating link sets that highlight the interrelationships between items with no visible connection. Harmonic oscillators from physics have applications in fields from molecular

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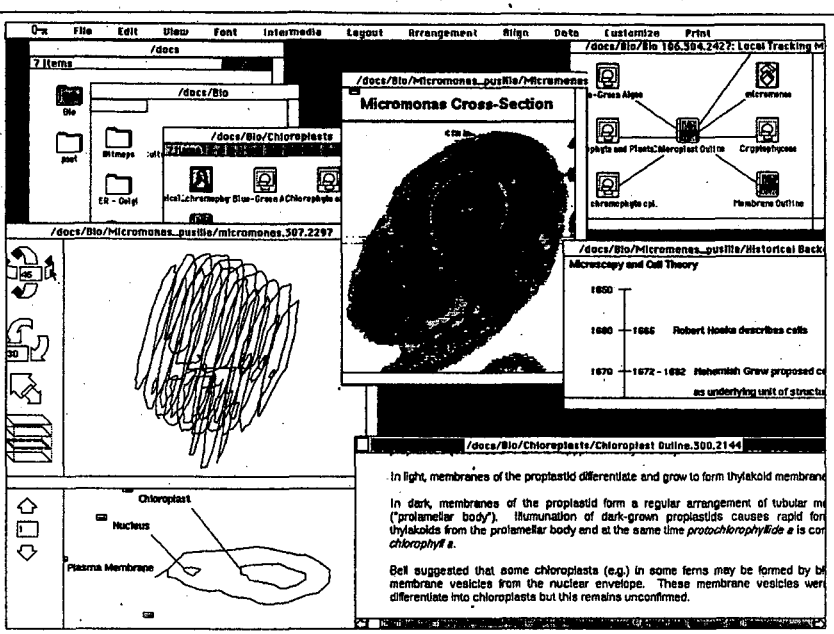

Figure 8. Example of Intermedia, developed at IRIS, in action. The electronmicrograph of the micromonas was originally published in *The Journal of Phycology* and is reprinted with permission of the editor.

biology to cosmology; a unilateral pull-out of Soviet forces from Europe several years ago, heralded by some news people as an overture of peace, turned out to be a preparatory step for the invasion of Afghanistan a few months later—long after everyone had forgotten the connection.

A link-set spanning just the history of the United States might save us from the great danger to technology that I alluded to earlier: the danger that, as our ability to process paper increases, bureaucrats will increase the amount of paper. One set of buttons that I am personally eager to insert into an American history information space is a set of links connecting governmental regulations with the consequences of those regulations—*all* of those consequences. In the early days of railroads, short-haul passengers felt outrage that the railroads charged almost as much for short local runs as they charged to go the long distance from New York to Chicago. These angry citizens put the railroads under government regulation, and this fixed the problem: the long distance fares were increased[10]. This might sound like a strange fluke—but the same thing happened when government took regulatory control of the air lines. The future is all

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too predictable for those who remember the past—for those who have a rich set of interconnections showing the relations between those past events.

Perhaps easily accessible linkages, reiterating these relationships between laws and consequences, would help Americans to understand their vital role as cultural engineers. With such an understanding, our interaction with bureaucracies such as the government could become more rational. We could make institutions more effective—or we could *intentionally* make them less effective, based on a deeper understanding of effective government.

Just this one clear articulation of the relationship between people and institution could pay for the entire effort of building our information space. Who knows where we might go from there? ■

Author's Note: Needless to say, this document was first drafted in hypermedia, then translated to linear form.

References

[1] *Literary Machines*, Theodor Nelson, Project Xanadu, 1987. This book discusses hypertext from the perspective of hypertext's originator, and as such is as close to a bible as one can get in the field. A hypertext version of Literary Machines is now available from Owl International.

[2] Guide is a product of Owl International. For further information contact Ed Taylor or Jamie Welch at (800) 344-9737, or write to Owl International, 14218 NE 21st St., Bellevue, WA 98007.

[3] Hypercard is a trademark of Apple Computer, Inc.

[4] *David's Sling*, Marc Stiegler, Baen Books, 1988. For more information about the hypermedia version, call (800) 877-2232 ext. 653.

[5] *The Elements of Style*, Strunk and White, MacMillan Publishing Company, 1979.

[6] *Engines of Creation*, K. Eric Drexler, New York: Anchor/Doubleday, 1986. In addition to being the preeminent book of nanotechnology, this book discusses the possible impact of a Xanadu-style hypermedia system on the nature of debate and decision making.

[7] *Marooned In Real Time*, Vernor Vinge, *Analog*, May-August 1986; Baen Books, copyright 1986. This is, to my knowledge, the first time the term Singularity was used to describe the result of ex-

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ponential advance in technology.

[8] "Iris Eyes," Roger Strukhoff, May 1988. Also see "Intermedia: The Concept And Construction Of a Seamless Information Environment," by Yankelovich, *et. al, IEEE Computer*, January, 1988. If you have further questions, you may write to IRIS Brown University Box 1946, Providence RI, 02912.

[9] "Managing Immense Storage," Theodor Nelson, *Byte Magazine*, January 1988. This article describes the nuts and bolts behind Xanadu. For further information contact the Xanadu Operating Company, P.O. Box 7213, Menlo Park, CA 94026.

[10] *Free To Choose*, Milton and Rose Friedman, Avon Books, 1980.

● "I do not know about monkeys eating monkeys, but I do know about men eating men, for certainly all evidences of anthropology point to a pretty universal practice of cannibalism. That was our carnivorous ancestry. Is it therefore any wonder that we are still eating each other in more senses than one—individually, socially, internationally? There is much to be said for the cannibals, that they are sensible about this matter of killing. Conceding that killing is an undesirable but unavoidable evil, they proceed to get something out of it by eating the delicious sirloins, ribs, and livers of their dead enemies. The difference between cannibals and civilized men seems to be that cannibals kill their enemies and eat them, while civilized men kill their foes and bury them, put a cross over their bodies and offer up prayers for their souls. Thus we add stupidity to conceit and a bad temper."

Lin Yutang

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INDIAN SUMMA

There's more than one way to adapt to a changing environment.

William R. Warren, Jr.

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Silicon Strip, they called the place the gleaming vistas of Greater Talequah, the fabulous Native American technology complex that blanketed many square miles of eastern Oklahoma hills. *The Indians Won*, the local Okies said, somewhat less enthusiastically, as the Indians bought them out in an effort to reestablish the old Cherokee Nation. Whatever you called it, I was impressed: mile after mile of velvet-metal finished, four-storey buildings blending almost vanishingly into the low, rolling brownish hills. Miles upon miles of economic miracle, an endless fortress, it seemed the new American bastion against the colossal cornucopia of cheap goods spewing forth from the Four Chinas.

Indians Won, America Too, the pun formed in my mind, but my attention quickly diverted to a loud annoying "Beep!" The heads-up instruments on the windshield sounded warnings. I was being scanned by sensors, presumably embedded in the pavement of the road in the surrounding properties of Cherokee Technologies, Inc. At least, that was the name emblazoned in large holographic letters over the gate I was driving through when the alarms sounded. "Quiet, car," I commanded, swinging my maglev to a smooth halt above the parking space labeled *Visitors*. The car drifted down to a comfortable level and I alit, leaving the vehicle in its rest position, floating nine inches above the parking lot.

Inside, a darkly handsome man, late thirties, stylishly outfitted in a four-piece suit, greeted me. "Professor Hemmert, I presume," he said, perfect white teeth complementing a holo-star's rugged features. I nodded. "I'm Chief Jeff Ross. Won't you come into my office?" I followed.

That office was another world, literally. Holographic images of primitive life in the southeast filled the walls: Chief Ross and I sat, incongruously, in modern float chairs at the edge of a wide expanse of rolling green hills. An intensely blue sky, filled with birds of incredible variety, seemed so real I could have touched it. My amazement must have shown.

"Yes, the effect is as good as technology can make it, Professor Hemmert." Ross peered into the illusion and pointed out moving objects that resolved themselves into human figures walking into a forest clearing. "We've even got names for these people now. This is a branch of the Cherokees in eastern Tennessee, some three hundred years ago."

He stood and stared at me. "Before the whites arrived."

I coughed. "You have read my stories of the Cherokees, then, Chief Ross?"

"Those stories are the reason you are here, Professor Hemmert. That, and your one-thirty-second of mixed Cherokee and Choctaw blood." Ross' acknowledgement of my little secret broke the ice. We talked for about an hour about our backgrounds and his reasons for having me out to Talequah.

"Professor, I especially liked the fantasy trilogy about my ancestor, John Ross. Where did you ever get the ideas about John Ross' travels to the Underground World?"

"An easy one, Chief. History shows that your predecessor scouted out new homelands for the Cherokees, and was in Arkansas shortly after the 1810 New Madrid earthquake occurred in southern

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Missouri. I always thought it strange that Ross' reports told of a vast and desolate treeless land when in fact no such place exists within three hundred miles of Arkansas. It was a simple matter to extrapolate the Underground World from there. I, of course, apologize for stretching the story out to three books, but you know about publishers and their demands. Markets and all of that."

"For a college prof, the extra money must have helped, too?" he smiled. He had done some research on me, it appeared. "Anyway, your books have helped improve the Cherokee image. An intelligent, courageous man, exploring unknown territory, defeating strange creatures with bravery and intellect. We here all appreciate that. Also, we liked your other science fiction and fantasy novels about Native Americans. And that is why you were invited." *Really?* I thought. *I wonder who is playing what game here.* Ross smiled and motioned me to follow him into a shimmering doorway that appeared in the middle of one of the scenic walls. It looked like he was disappearing into open air.

I went.

The next room, to my relief, was an antechamber to the vast factory complex. I gaped: the place must have stretched miles in length and width and I was damned if the roof didn't seem like another sky, a light blue dome that had no end. To my left and down a long flight of stairs was an immense field of standard factory equipment, operated by an army of workers. In the center of my field of view, forklift trucks carted crates of products and loaded them into hundreds of maglev semi trucks. Though I could judge factory parameters by the size and numbers of machines and workers, and though I had done my homework quite discreetly before coming to Talequah, I was still astounded.

The goddamned place was incredibly *huge!*

"Sometimes I am stunned by the size of it too, Professor." Ross laughed good-naturedly and helped me into a lab coat and safety glasses and we walked down three hundred and thirty-six steps onto the factory floor. *How the hell do they get this much room in those four stories?* I wondered. The construction records didn't show any significant excavations when the Strip was built. *And the amount of metal in these miles of walls! Wonder if anyone has ever calculated the cost of this place? And where did they get the money?* I reminded my subvoc recorder to check up on the construction financing. I'm sure the Other Chief would know.

"Find out what those Indians are up to, Professor Hemmert," the Other Chief had said, two months ago. "I can tell by your look of surprise that you don't want to be an industrial spy, but by damn your country needs you!"

I looked nervously around my office and tried to gain composure by concentrating on the charms of a coed walking by outside my ground-level window. I didn't want to work for The Customer, but by now almost every academic in the university had prostituted himself or herself in The Customer's service just to keep the grants coming in. And here in the creative writing department those grants were damned difficult to get! Although The Customer's grant money was not absolutely essential to my

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life—as far as I knew!—it surely made up for the low university pay and the dry spells between royalty checks. That money also made possible annual sabbaticals for research. And an occasional Russian vacation. And a maglev car.

Yes, this Other Chief, just like Chief Ross, knew his business. His tone of voice alone conveyed enough threat to get his unspoken message across.

I sighed. I would do what this man wanted, to keep the modest grant money coming in, and besides, he had piqued my curiosity. What *were* they doing out there that was revolutionizing the balance of trade and making all Native Americans rich? "All right, er—Chief, I don't mind another trip to Talequah. It's been ten years since I did my research there. I'd like to see the Silicon Strip complex for myself, anyhow. What should I look for?"

The thought of my intensive industrial spying training regimen brought a sudden pang of conscience. What would Ross think of my actual agenda? Could he know?

But the big man was waving at a locomotive-sized piece of green-painted equipment. "This is our megaton injection molding press, Hemmert," he shouted over the *whump!-shhh-whump!* as the gigantic machine cycled through its molding process. "Look down at this end!" There, a completed plastic maglev car body was ejected from an opening, like a monstrous defecation, ready to fall the five meters from the orifice to the floor. But in mid-drop an articulated robot tentacle deftly caught the car body, and swinging it in a circular trajectory, deposited it onto a meters-wide conveyor belt.

"Their damned plastics gave us the first clue, Professor," the Other Chief had said. "No seams, no marks. Every injection plastic molding tool has at least two parts, so you can open the tool up and let the plastic part come out. These Indians make parts without any marks! And you wouldn't believe what they can do with nanotech! Believe me, these are dangerous secrets that we can't trust in the wrong hands. You have to find out all you can before the Japs and Chinese do. Can't let foreigners steal those secrets." I had wanted to point out that the "secrets" were already in "our hands," and I never did know why he considered *my* assignment as anything less than theft. But the fact was that *he* controlled *my* job security so *he* gave the orders. And *I* took them.

At my request, Chief Ross let me inspect the newly-molded auto body. To my additional surprise, I saw that not only was the body molded as one piece, but that the doors could be opened and closed, that the fabric upholstery was already in place, and that even the safety glass *windows* with full heads-up control displays had been molded at the same time! "How do you mold all of this, Ross?" I sputtered. "There's no way to get fabrics and glass and hinges and electronics and . . ." I stopped as he turned around to glare. "I mean, *is* there?"

Ross merely snorted. "More to see, Hemmert. Come along."

"More to see" was an understatement. In the course of the next four hours I saw technological advancements that shouldn't have existed: low shallow

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vats growing square kilometers of perfect semimorphous crystals, the fantastic power transducers that even the Japanese were only just now successfully growing. I had understood before then that semimorphs could only be grown in the micro-*gee* of low Earth orbit, and then only in mere square centimeters, not huge production quantities.

Ross then showed me what I would have to call *nanotech nations*—trillions of molecular-sized robots in a featureless meter-cubed gray box. A wall-projected scanning electron microscope scene of the interior of that nanoworld revealed a god's-eye view of untold numbers of incredibly complex robotic creatures scurrying about in their programmed destinies. "Each of these tiny meter-cube nano-nations can be instructed to produce whatever we need, Professor. Watch." Ross peeled off his wristband computer, an expensive Singapore original, and dropped it into a hopper. Tapping a quaint touch-screen keyboard, he turned and said, "At the other end, Professor. Just like the car body."

An orifice and protruding tray appeared on one side of the cube and Ross' computer appeared. Then it appeared again—no, it had to be only a copy! Then another copy, and more, until the tray filled. At the chief's urging I took one of the expensive wristbands from the tray. It was replaced by another copy that slid from the box.

"Ironic to be making copies of Oriental originals, isn't it, Professor? But that's beside the point; I hope you like our little slaves." He scooped up a handful of the wristbands—"Souvenirs for my kids"—and the tray filled up again. Ross punched a flat-screen command and the tray slid into the metal box. "Recycling."

Ross called up a two seater maglev rickshaw and we floated the rest of the tour. I was grateful for the ride, especially fearing the hike back up the three-hundred-odd steps with my aching feet. Riding back, I could have sworn we were covering more distance than we had walked out. Even the terrain looked different, and I decided we were seeing unused portions of the Strip. I glanced at Ross inquisitively but he didn't respond, seemingly engrossed in the changing projections on the vast factory walls. Out in the far reaches of the incredible complex, away from the busy industrial areas, the Indians had maintained the illusions of eastern forests, midwest prairies, southwestern deserts. The projections were perfect. Environmental controls—humidity, temperature, even subtle odors of plants and animals—added to the perfection, if that was possible. I could have easily slipped into that primeval and peaceful world.

Somehow, too soon, we were suddenly back at the molding shop in the factory area, now a deserted place with the workers all gone. The maglev took us up the hundreds of steps and deposited us in Ross' antechamber, and we rested in his office with drinks.

"So what do you think of this enterprise, Professor Hemmert?" Ross sipped his Scotch. I must have hesitated, for he quickly shot back, "Nano-tech buffers for alcohol control, Hemmert. No drunken Indians here." A knowing smile assuaged my doubts. I guess I *had* been thinking that.

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"It's absolutely incredible, Chief Ross. We had—they had—I mean, *I* had—no idea that you were so far advanced. There must not be any other factory in the world—or even off the world—that can do what you do routinely here." I stood and stared at a whole tribe of plains Native Americans folding their tepees and preparing for a southern trek. I could feel the threatening north winds of incipient winter, smell the acrid smoke of dying campfires. I was as impressed by the projection technology as anything else. Not being an engineer by training, only a technical writer and then a fiction writer, I had undoubtedly missed other, more subtle feats of more technologcal importance. But I liked the pictures best.

I felt guilty as hell.

"You're a real non-tech, Hemmert. The square kilometers of semimorph growth didn't affect you, the nano-nations you took in stride. But you love the scenery.

"Fair enough. That shows you have enough of the blood, so hear me out." A wave of his hand at the wall transformed the rolling green hills into a dark, star-lit flattop mountain. The edge of the precipice was an arrow-shot away in any direction and darkness engulfed the distance beyond. We were standing alone in a tiny corner of the universe. At my feet gravel crunched, so perfect was the illusion. Even the furniture was gone.

Strangely enough, though I took little notice of it at the time, my clothing was different and I felt the rough texture of bare ground under soft moccasins. Standing beside Chief Ross, who was wearing an illusory cloak of shimmering material, was an incredibly ancient Indian clad only in headband and blanket. In his wrinkled outstretched hand he held a broken white crystal with a central reddish thread that pulsated with a throbbing glow. I wanted to touch it, the holy relic of the Cherokee, but frozen in fear, I couldn't move. The old man looked into my soul with sad, dark eyes.

Ross spoke softly. "This is Quanah Coweescoowee, shaman of the Cherokees. Professor Hemmert, Quanah." I nodded respectfully. The old man moved not a millimeter. I couldn't tell if he was living or carved from dark wood.

Chief Ross smiled and touched his hands together, fingers upward. In the next instant of consciousness we were both back in his office sitting on floater chairs. The sylvan forest surrounded us. "Did you like the trip, Professor?"

Stunned, I said nothing, but body language gave me away.

"Not to fear, Hemmert. That demonstration was an object lesson for you and also for that Other Chief. Yes, even if we had not known about The Customer's interest in this place, you positively exude guilt." Chuckling: "You'd never make a spy, you know."

"I'm . . . I'm . . . I apologize, Chief Ross." I stood and started out toward the door before I realized I couldn't find it in the wall projections. Turning to him in embarrassment, I stammered, "Look, after you invited me here The Customer put intolerable pressures on me. I am sorry I took advantage of the situation. I don't even know how that Other Chief knew about your invitation, or how you knew about him, or what the hell is going on. I just feel bad about the sit-

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uation." I walked up to his desk and tried to look forceful. "At least you can be goddamned sure I won't tell him a thing. I can promise you that!"

Ross grinned and waved his arms in forgiveness. I was dumbfounded. "Look, Hemmert," he said, "that Other Chief implanted your clothing with all kinds of nano-bugs, so he could have had a look at everything you saw today." I tensed in the knowledge of betrayal of my host. "But not to worry, Brother. We have some of our own even nano-er bugs 'with which to prey upon 'em.' "

"I don't understand, what—?"

"You were invited here because of your sympathetic novels and stories, and because we know you cherish your Native American bloodline. We keep tabs on all who check their Indian lineage. We also knew you would be under pressure to spy for The Customer; but that's a price we pay, willingly, when we want to recruit one of our own."

"Recruit? I—"

He waved me silent. "You are hired if you want the job. We need blood brothers with imagination, someone to help recapture the myths and legends of old, to help us find our soul. We need a storyteller."

"Storyteller, Chief?" I gestured toward a projection wall. "Why not some more technologists? I couldn't even throw the switch to turn these walls on and off. I *know* I couldn't design those impossibly seamless, fully-functional maglev car bodies, those vats of semi-morphs, those universes of nano-genies, that—"

"*Design*, Hemmert? What makes you think we *design* anything?"

"I—do those things just *happen*, then? I can't believe that!" I was afraid of where he was leading and I didn't know if I could handle the implications.

"Our designer, if you insist, was Quanah Cooweescoowee, whom you met out on the dark mountaintop, Hemmert. I told you he was a shaman. He helps his people. What do you think shamans are supposed to do?"

Chief Ross looked tired, the kind of tired that comes when a load is finally set down and the muscles protest almost as much as when they were strained by the load. "Our people, all Native Americans, were dying, Hemmert. We had lost the whole continent to the whites, but worse than that, we were losing the mental and spiritual frontiers. Trend analyses indicated we would be completely defeated, totally assimilated into white culture within a hundred years or less. All of the Cherokee culture, the Choctaw, that of other tribes, would be mere footnotes in academic papers.

"So we decided to compete on our own terms, to do what we know best—use our shamans and our magic, not to fight the whites, but to outsmart them. We have used the ancient spells, we have resurrected the ancient knowledge systems that once held off the night and our natural enemies.

"We have sought out people like yourself, those who carry traces of the blood and also who can help us recapture the mythos of our primal life, and turn it to modern uses."

"I'm afraid I still don't understand, Chief. What does myth have to do with this fantastic factory of yours?"

He shook his head and the familiar

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smile returned as he reached some kind of mental and emotional equilibrium. "Professor—Brother—Hemmert: what I showed you out there is impossible. You *cannot* inject plastic into a mold without two parts to a tool. Surely the Other Chief taught you that much!"

"But what, then?" I ventured.

Ross pounded the desk but he was grinning all the time. "Our young men have learned apportation from our elders—they *apport* the plastic into the mold! They *apport* the electronics and the glass and the fabrics and all the rest! Then they *apport* the finished product to the end of the machine. They have no idea why it works, but by god it does work! By white man's physics that can't be done, but they do it!"

I gulped. "And the nanoes? The semi-morph?"

"Same thing, Brother! They only *look* like real processes, like real device, like real technology. A quick analysis by a competent techie—" I bristled at the implication "—would have shown that we get out more mass and more energy than we put in, that we can't possibly make those processes work without—" He paused.

I gulped again. *"Magic?"*

He came over and grabbed me with both arms and pounded my back and then pushed me away, holding both shoulders tightly and shouting in a strong, joyous timbre. "Hemmert, those wall projections, those vistas out beyond the factory. They are real! Nobody could make such images. Our people go out into those worlds to live, to hunt, to revitalize themselves in the old ways, then come out and work in the factory part-time to support the rest of the tribe, and to support the illusions that keep the white world at bay.

"In the old days, we dared not fight the white man with magic—we would have been exterminated down to the last baby. But now, yes! We disguise our old-time magical powers as machines, and the world accepts them!

"The beauty is, no one, no spy, not even your Other Chief, will believe what we've accomplished here! Old, unsophisticated magic could not make it, but our new magic has! Arthur C. Clarke just had it all backwards."

Somewhere, deep inside a great satisfaction swept over me. At last I understood. I had found my job, my home, my destiny.

Ross understood and laughed aloud. We shouted it out together: "Any sufficiently advanced magic is indistinguishable from technology!" ■

●Some circumstantial evidence is very strong, as when you find a trout in the milk.

Henry David Thoreau

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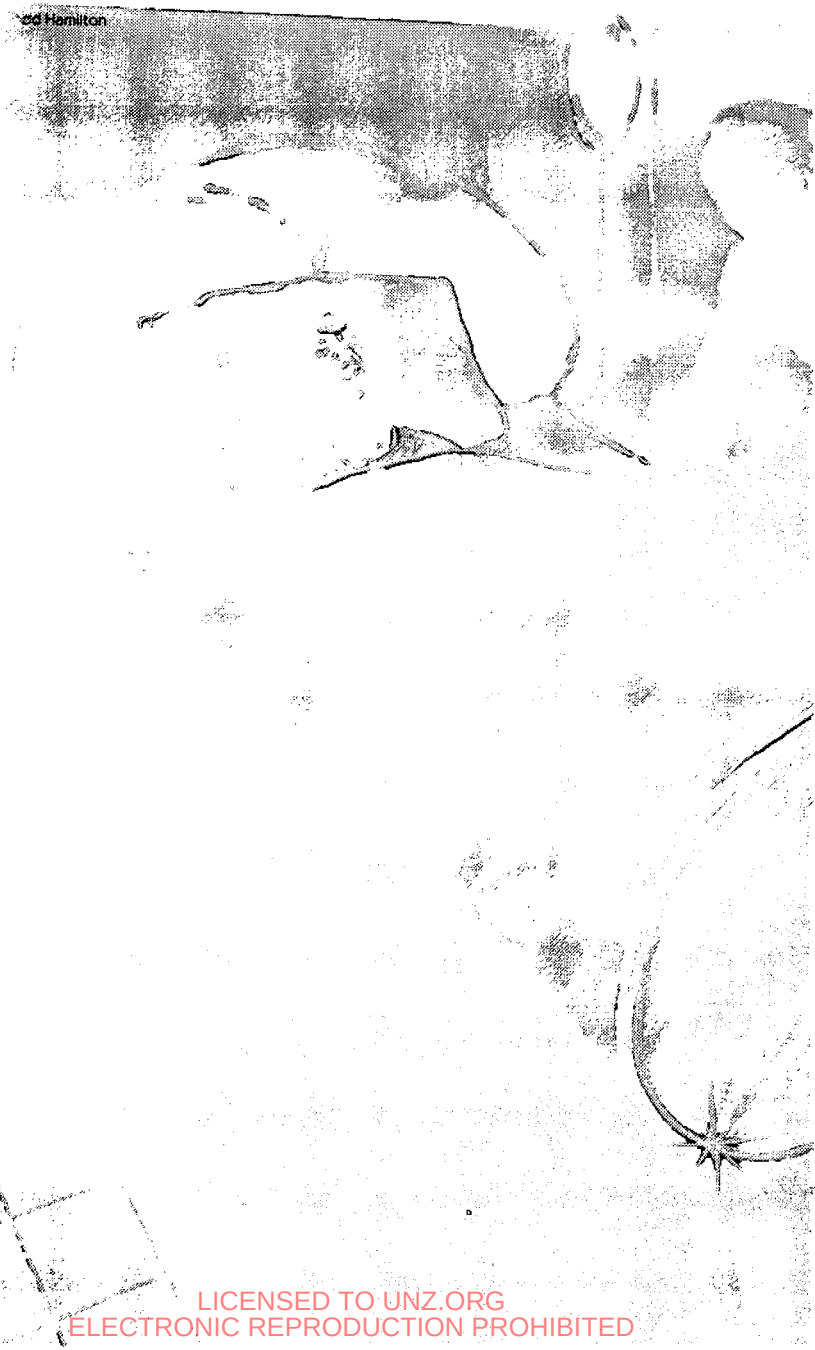

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T PROMISE

A. J. Austin

"All men are created equal" sounds wonderful—but it's not true in all [illegible]mes they might wish.

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Even though they had avoided talking about it at length, it was much too late to ignore it: there was death above this hospital room. It hung like a shroud of moss from a tree, growing ever larger until gravity tried to pull it down to Earth. But it never quite seemed to make it; it always landed on the branch just below, smothering it and growing larger still, until the cycle repeated itself yet again. How long before its fall continued, branch by branch, until it finally fell on Kathy, lying in the bed below? How many branches, for that matter, now separated Death from Kathy?

If a stranger wandered into the room, he might assume that a dutiful son was attending his mother's final hours, that's how badly she had been destroyed by the cancer that would soon kill her. What was left of her once beautiful red hair was the color of ashes. Her face was pale. Her eyes had sunk so deeply that it was difficult now to tell that they had once been the color of the sky. To look at Kathy now, a stranger would guess she was at least eighty, even though she had turned only fifty-nine just last month.

Robert Jernigan looked away from his wife, letting his eyes stray to the fading crepe paper flowers and streamers still hanging from the ceiling light fixture. A small sign, brightly colored in crayon by the hands of a five-year-old child proclaiming "Happy Birthday Grad-Ma!" was still Scotch-taped to the window overlooking the bay. She had refused to allow the sign and other decorations to be taken down, as though the remnants of a happy visit a few weeks earlier could somehow deny the reality that Jimmy wouldn't hand letter a sign for his grandmother's next birthday.

Her breathing, as always, was soft and light. Sometimes, when he looked out the window of the small room, he would imagine her simply napping on a warm June afternoon. When he did, he'd often let his mind wander while watching the gulls sailing in the warm sky above the bay. Listening to the soft sigh of her breathing, watching the waves break on the beach and the gulls swooping for small fish in the surf, he could almost feel an afternoon some forty years earlier. They had met on a Sunday morning and had spent the entire day together; swimming, chasing and splashing each other, riding a small rented cat in the waves near the shore. Neither had ever sailed one before, but their clumsiness in itself was fun, and drew them still closer together. Later, on a deserted stretch of beach, they had made love on a blanket and napped in the warm sun. He had awakened before she did, and had sat up and just watched her sleep, listening then, as now, to her soft breathing and the playful sea gulls. How beautiful she had been lying there, and how fast it had all happened!

A sudden irregularity in the breathing startled him, and he looked back at his wife. Her sleep seemed restless; she would be waking soon. Looking at her now, he couldn't help feeling anger at how horribly different she appeared from the wonderful memory of that long-ago Sunday. Why did he allow himself to remember the past, when it hurt so much compared to the present?

"Kathy? Honey, are you awake?" She stirred restlessly, but he didn't bother to speak again. If she'd had

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enough sleep, she would wake up on her own. He leaned over the bed, careful not to entangle himself in the life support tubes and wires from the monitor above the bed. Gently, he kissed her on the forehead.

"Robby, is that you?" Her eyes opened, blinking rapidly, but he knew she'd be disoriented for a time. She trembled slightly, sounded frightened as she reached out for him. Even staring directly at him, she couldn't yet see him clearly.

"Yes, honey. I'm here. Everything's all right," he lied, holding her by the hand, squeezing the delicate, brittle fingers as tightly as he dared. He hated this disease, hated watching his beloved Kathy dying a little bit each day. But he hated this minute or two of waking even more, because in addition to everything else she had to endure, for these few moments she would feel lost and alone, terrified until she could become fully awake. He long ago realized that the pain she felt daily, was nothing compared to the dreamy not-knowing fear that she was going through right now.

"It's OK. I'm here with you and everything's all right," he said, continuing to softly caress her hand in a way she had lately come to need, more than enjoy. She quieted as her vision cleared, and a realization of where she was began to sink in. She lay silently for a few minutes, staring past him at the curtains moving slowly in the slight breeze.

"I'm sorry," she said, her pained voice barely more than whisper. "I try so hard not to get scared, but when I wake up, I—I just don't know where I am. I'm afraid that it's finally happening and I won't have you here with me. I don't want to die alone, Robby.I just can't." She cried softly as he held her, rocking her tenderly back and forth in the bed.

"I'll be here. I'll always be here, I promise I will."

She sobbed quietly for a while, occasionally squeezing his arm tightly. He held her that way for a long time until a slow, regular breathing told him she was again asleep. He continued to hold her a few minutes longer, and then gently released her, making her as comfortable on the enormous pillow as he could.

Leaving the room, he looked back for only a moment. *One last look before I go,* he thought. *I want to see you peaceful, comfortable; lying there as beautiful in my mind as that day on the beach so long ago. I want to hold you that way in my mind as I leave, just in case I can't keep my promise to you, my love.*

Robert Jernigan turned away without tears, but only because no tears remained, and left the room; closing the door slowly, softly behind him.

Dr. Reade Lauver was a cynic, just as many in his profession had become cynical. Advances in medical science had reduced humanity and morals in most terminal illnesses to a simple case of "The Four Ifs." IF you had the right doctor, and IF you had a body type compatible with the remission processor, and IF you got the treatment in time, and, above all, IF You Had The Money, why, then the treatment was a veritable fountain of youth. Oh, but that final "if." The treatment was prohibitively expensive, and insurance wouldn't touch it. It had become the ultimate cosmetic

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surgery of the very rich—a dip in the fountain for those who could most afford it. How many times had he condemned a patient to death because the family lacked the necessary money, and then performed the treatment on some wealthy pig who looked upon it as little more than an expensive facelift.

It was even worse in cases like the Jernigans's. The poor guy had sold everything he owned, and then some, to raise the cash. A few weeks ago, he'd thought this was one of the times that a deserving person would actually benefit from the procedure, someone he really wanted to help save. But one in ten people couldn't accept treatment, and Kathy Jernigan was that one.

"I'm sorry, Bob, but Kathy just isn't compatible," he said, dropping a manila folder marked "Jernigan" on the desk. He always found it difficult to look directly into the eyes of a family member when he had to tell them the truth about their loved one's chances, so he pretended to study the forms inside the folder as he spoke. "About the best I could give her is a 20 percent compatibility. Make it 25 percent at the outside. I just won't make a recommendation based on that. I've been your doctor and friend for too many years to allow you to throw your money away on something that just isn't going to work."

"What's the lowest compatibility you'd accept?"

He's grasping at straws, he thought. *He worked so hard to get the cash and now that it's close enough to touch, he just doesn't want to let it go.* "If she even had a fifty-fifty chance, I might be willing to consider it. But please understand, Bob, no one with less than 50 percent has gained enough extra time to make the procedure worthwhile. No one. I'm sorry Bob."

"It's not fair."

"I know it's not, and I'm sorry. I really wish I could tell you something different, but I can't." *Oh, God, how I wish!*

Jernigan took a deep breath, released it in one long sigh. "How much longer? There, I've finally asked it."

"I'd have to say just a few weeks. Maybe a little more." He paused. "I've got to be honest with you, though—I'm being optimistic. It might not be that long. You've got to be ready to accept that just in case."

"I guess that's it, then." Robert Jernigan shook the doctor's hand, then rose and quickly left the office. He didn't close the door.

Looking into the small reception area, Dr. Lauver watched as he left. Sitting in the waiting room was Margie Fletcher, wife of Congressman Fletcher. He glanced at his schedule for the afternoon, and, yes, she was due to see him in just a few minutes. At forty-eight, she had the body of a thirty-five year old. A quick glance at her file showed that she was in for her second trip to the fountain in ten years. With a compatibility of nearly 90 percent, she could expect to look in her early twenties when she left the hospital in a few days.

Money, of course, was no problem. The good congressman liked his wife to look young.

It improved his public image.

She was awake when he got to her room; that hadn't happened very often lately. He was about to apologize for

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not being there when she woke up, but decided it would be better not to mention it. Besides, despite her poor condition she looked to be in fairly good spirits this morning. The curtains had been parted and the window opened slightly. The room was bright and airy for the first time in all the long weeks she'd been in it. God knows what she had to do to bribe that bitch of a nurse to get it done. Her thin hair had even been brushed, pulled to one side and tied at her shoulder with a simple pink ribbon. She looked up and smiled at him when he came into the room, used what strength she had left to sit upright, folding her hands in her lap. He knew why. She was hoping for good news from Dr. Lauver.

But even as his own smile greeted her, he watched hers fade. Her eyes, only moments before bright and alert at his coming, began to dull as the tiredness returned not only to her face, but to her entire body. The shoulders seemed to sag. The hands quivered slightly. She looked like she was visibly shrinking even further into the pillows the nurse had propped behind her back and head. *Am I that easy to read? But then, I've never been able to hide anything from her; would never really want to.*

She looked to the side, out the window where the ever-present gulls flew in circles over the damned bay only a few miles distant. He wished, not for the first time, that her room looked out on a parking lot, or even a brick wall of another wing of the hospital; it would be less painful.

"I'm sorry, honey, I—"

"No," she said softly, simply, cutting him off before he could finish. "It's all right. Guess I was kidding myself. I think I already knew what the answer was several days ago. I just thought I'd try to put on a cheerful face for you. I really did think I could do it. Guess I'm not as smart as I think I am, huh?" She smiled again as she tried desperately not to cry.

He pulled one of the room's two chairs from the corner where the nurse kept shoving it whenever he was out of the room, placed it beside the bed, sat down, and slowly stroked his wife's hair. For the longest time, neither said anything. In the stillness of the room, you could just hear the gulls. He tried to pretend he couldn't.

"I'll be gone soon," she said finally, shocking him with her bluntness. "If I asked you to do something for me, something that means more to me than anything in the world right now, would you do it?"

"Yes, you know I would." As much as he'd been dreading it, it had finally come. They had to admit out loud, for the first time, that in a very, very short while, she would be dead. They needed to make those plans, talk about those things that have to be discussed, have to be decided upon while she was still able to take part in the decisions.

She paused briefly before continuing. Her breathing was more labored now, he noticed, than it had been this time a week ago. As the end got closer, she seemed to deteriorate even more quickly each day. "I've been thinking about this for a long time now: what would we do if it wouldn't work for me? I know how hard you worked to get the money for the treatment. I don't want it to go to waste. Take it—I want you to use it.

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"If I have only a few weeks left, I want to spend them with you. I want things to be as close as possible to how they were when we met. Honey, no woman has ever been happier than I've been. I could never have hoped, prayed for a better man, a better husband than you've been to me. Use the money on yourself, Robby, and let me spend the rest of my life with you—from the beginning, all over again. I want that strong young man to sweep me off my feet again, to hold me in his strong arms again, just like you did that day we met. Please—promise you'll do that for me."

The tears had stopped running down her cheeks, but she looked so tired as her eyes pleaded with his. Even though the hand shook, the grip on his arm was tighter, stronger than it had been in months. He bent down, putting an arm gently behind her. He held her, hugged her as tightly as he dared, stroking the back of her head with his hand, wiping the tears from her face as they reappeared.

"I love you so much," he said, beginning to cry himself. It felt good to cry; he had worried lately that when the time came, he wouldn't be able to. But the tears came easily, comforting him as he let himself weep.

"I would do anything for you."

What day is this? she wondered, afraid to open her eyes. *Please, God, let him come today.* He'd said it would take no more than a few days, but it had been almost a week since he'd last held her. She missed him, missed hearing his voice. With a shaking hand she reached for his usual seat next to the bed, but there was nothing there.

The room spun, as always, when she finally dared open her eyes. The lights were on, and she blinked away tears at the sudden brightness. She forced herself to remain calm, to control the disorientation as much as she could, but still her heart raced as she came fully awake. The door was closed and, except for the muted sound of traffic from the direction of the window, silent. In the stillness of the room she heard someone clear his throat and turned her head slowly toward the sound. Someone, she couldn't make out who it was, was sitting in a chair with his back to her, staring out the window.

"Who's there? Robby, please say it's—" A desperate wheezing sound came from somewhere deep inside her throat as panic blossomed within her. In fear or in pain, she wasn't sure which, she tightly closed her eyes. The man was out of the chair and kneeling at the side of the bed in an instant.

"I'm here," he said, reaching out to take her hand, patting it softly as he did. "Everything's all right. I'm here, honey."

She quieted then, becoming almost peaceful. And as she relaxed, the breathing slowed, although the wheezing sound remained. Her eyes opened, slowly and delicately, and her vision began to clear. A smile spread across her wrinkled face as she looked at him; happy tears involuntarily filled her eyes, ran down her face as she recognized the young man smiling at her.

"Hey good-looking, sure is a hot day out here. Say listen, I've got some Oly's on ice in a cooler over there by my blanket if you're interested," he chuckled.

For the first time in months, for the

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first time since they found out she was dying, she laughed. Long and loud, and stronger than she could remember. She couldn't stop smiling, crying, laughing all at once. She was so happy. It was him, exactly as she'd remembered, exactly like the picture in the small frame sitting next to the bed.

"I—I'd love to," she answered. Now what was it? Yes, now she remembered. "What—what is it you're offering to share? The beer or the blanket?" She laughed again and felt his strong arms surround her in the small bed. It felt like he could easily lift her, carry her running across the beach. As she hugged him, she could smell the aftershave he'd used that morning. Where had he found it? He'd long since used up the last of the bottle she bought him for a Christmas some ten or more years ago. They didn't make it any more.

She tired quickly from the laughing and eased back onto the pillows, breathing hard from the excitement of the moment, from the memories racing back. He released her then, arranging the covers to make her a bit more comfortable and reached beneath the bed. He mischievously glanced side-to-side as though he were being watched by some unseen person, then grinned broadly when he pulled a can of Olympia from a small cooler. "Don't let the lifeguard see you with this or it's my ass. I've already been kicked off this beach *twice* this summer."

She smiled again as he quickly snapped open the can, took a quick chug of the cold beer, and held the can out to her. "Here you go—no germs, honest!" He'd remembered it all.

"No; no thanks, Robby. I just want to look at you. Please, let me look at you for a minute."

"Anything for you, good-lookin'," he said, standing up. She watched him as he slowly turned around in the bright sunlight streaming through window, like a model in some high class fashion show displaying the latest in men's wear.

The most obvious change was the gray moustache he'd worn for ten years. It was gone, as was the slight paunch he'd grown about the same time as the moustache. He stood strong, tall; taller, in fact, than she had remembered. A breeze from the window blew through light brown hair, freshly cut in the style he'd worn back then. He grinned at her, his deep brown eyes twinkling with the slight hint of mischief she knew lay behind them. A small scar on his chin, nearly invisible in recent years, stood out as she'd remembered it. In addition to tan casual slacks, he wore a bright Hawaiian shirt. *Look at that shirt! I threw that gaudy thing out years ago. He must have sneaked it back into the house before the trashmen came. Has he been hiding it all these years?*

It was him, young again, just as he'd promised.

"Well, if you're done staring at my body—" he teased, scooting the chair over to the bed and taking her by the hand. He leaned close and spoke softly into her ear. "Suppose I start trying to make you fall in love with me again? Let's see if I still remember how to pick up a good looking lady on the beach."

They talked for hours. Joking. Laughing. Holding hands and remembering things she thought he would have

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forgotten long ago; reliving a lifetime in which they seemed to once again grow as close as two people could. It was late afternoon when she finally became so tired she couldn't continue. *Too soon!* she thought. *Please, let me listen to you just a bit longer, then I'll sleep.*

"Hey," he said, looking at his watch. "Do you know what time it is? I'd better let you get some rest. Don't want Attila The Nurse raising hell with us. Not today, of all days. I'll be back tomorrow."

"No, please stay. Don't leave me just yet." But she knew he was right. She was exhausted, barely able to keep her eyes open. She just hated to let go; it felt so good laughing, loving Robby all over again. Finally, she stopped protesting.

"I'll wait here awhile till you fall asleep, though, if that's all right." He leaned over, kissed her gently on the cheek, brushing aside a wisp of brittle gray hair. He paused for just a second, looking at her tired face, then kissed her softly on the lips; lingering there in a gentle kiss that lasted several moments.

"I love you, Kathy."

"Oh, Robby. I love you so much. You're—so very special to me. Twice in one lifetime, you've made me happy. I don't know of any woman who could be so lucky." She sounded very tired, the wheezing seemed to be more prevalent now. She took his hand, squeezing it in hers as she brought it to her lips. A single tear rolled down one cheek, as she smiled and quietly fell asleep.

He held her hand and looked at her, the smile still glowing on her weathered face. The wheezing had stopped and the only sound in the room was the breeze from the open window, gently blowing through the curtains. Still holding her hand as she slept, he turned to watch the gulls, flying, dipping into the surf. Listening to their far-off cries, he relaxed slightly for the first time since entering the room.

He dropped her hand and jumped to his feet as an alarm sounded from the monitoring equipment above the bed. Only a few moments passed before the door burst open and several white-clad attendants rushed into the room. They shoved past him, moving to the side of the bed, ignoring him altogether. He moved back into the corner of the room, trying to stay out of their way. One of the orderlies was saying something hurriedly into the phone, another was jerking the covers off the bed. Even amid the sudden confusion, he saw that Kathy was still smiling.

He didn't belong here now, and he knew it.

Robert Jernigan sat in a bar about a block from the hospital, and although he drank alone, the bar was far from empty, even this early in the evening. A man and woman whispered to each other in a corner booth. A couple of men, construction types, were loudly enjoying a joke around several small tables they'd shoved together to make a larger one. The bartender was talking to a girl with all the markings of a hooker at the other end of the long bar. The room was dark, and the sudden light of the door being opened was apparent without turning around. A glance into the mirror behind the bar showed a young man in a flowered shirt silhouetted in the doorway. He stood there a

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moment as his eyes adjusted to the gloom, then walked directly to the stool next to his.

"Buy you a beer?" the newcomer asked, noticing that his mug was empty. Without waiting for an answer, he signaled to the bartender.

Jernigan didn't say anything, just stared ahead at his reflection in the mirror behind the bar. When the beer came, he chugged about half, paused for a moment, and then finished the rest. He set the mug down heavily on the bar, wiping suds from the tips of his gray moustache with the back of a hand. "Where have you been?" he finally said, turning to look at the young man for the first time. "The hospital called almost an hour ago."

"Sorry. I took my time, that's all. Hey, bartender! Bring my friend here another beer, would ya'? And a Seven-Seven for me." Neither man spoke as they waited for the drinks in an uneasy silence. The bartender brought them, then returned to his conversation with the hooker. He drank the beer slowly this time, still lost somewhere in his own little world staring at the mirror.

The young man had taken only a sip of his own drink. "Look, I'm really sorry about your wife, you know?" he said softly. "I really mean it, OK?"

Jernigan set the mug down, turning suddenly to his companion. The young man started a bit as Jernigan reached over and pulled the scar off his chin. The latex stretched slightly as it pulled free, then snapped and curled up as he held it between his fingertips. Jernigan looked at it for a second, and dropped it on the bar. He started to reach again when the young man caught him by the wrist with a grip that was strong, very strong. The bartender looked over, decided it was just a disagreement and not the beginnings of a fistfight, and turned back to the girl.

"If it's all the same to you, pal, I'll take my own makeup off when I get home," he said, rubbing the spot on his chin where the latex scar had been. He let Jernigan's arm drop to the bar top. "Listen, I really hate to bring it up now, but we had a deal."

"You bastard. Don't you feel anything? She was my wife!"

The young man started to protest, then turned away and took a long swallow from his glass. "Look, I've got to get going. We had a deal." His voice was measured, businesslike.

Jernigan felt old, much older than when he'd first met the young man only a week before. He reached into his jacket and pulled out an envelope. "It's all there. Just like we agreed."

"Thanks, Mr. Jernigan." The other glanced quickly into the envelope, finished the last of his drink, and started to leave. "Look, I really am sorry about your wife, and I'm sorry you weren't compatible. That's a tough break. But in my line of work, I've got my own treatments to think about. Nobody hires old actors. Thanks to you, though, I'll be able to afford another dip in the fountain when I need it."

"How compatible are you?"

"A hundred percent, friend; a hundred percent." He hopped off the barstool, offering his hand as he did. He held it there for a moment, then turned and walked away when it was ignored. As he passed the bartender, he tossed a hundred-dollar bill on the counter. "Give

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the old guy whatever he wants. Let him keep the change." Another moment of brightness as the door opened, and he was gone.

"Hey fella," the bartender said as he brought him a fresh beer. "You all right? I hate to see a guy get into a fight with his own kid." He took the empty mug, setting the fresh one in its place. A bit of foam ran down the side and across the bar where the curled piece of latex had dropped.

"He wasn't my son."

Embarrassed for a moment, the bartender quickly set about wiping up the spill. "Oh, sorry. He looked a lot like you and I just assumed—well, never mind. You wanna talk about it?"

"I've always kept my promises, you know? This time, though, I couldn't do it for myself. I got that young son-of-a-bitch to keep it for me." He had to laugh. The young son-of-a-bitch was older than he was.

"Sure. Whatever. Well, let me know when you want another." The bartender shook his head as he set the used mug in a sink behind the bar before returning to the hooker.

Ignoring the beer for a moment, Robert Jernigan looked at the latex scar, still lying on the counter top. The bartender's rag had missed it when he'd wiped up the beer. With a fingertip, he rolled the rubbery material into a tiny ball. *A hundred percent compatibility!*

And as he began to gently sob, he wiped the palm of his hand across the top of the counter, sweeping the little ball of latex to the floor, where it fell out of sight in the shadows behind the bar. ■

●"It gives one a feeling of confidence to see nature still busy with experiments, still dynamic, and not through nor satisfied because a Devonian fish managed to end as a two-legged character in a straw hat. There are other things brewing and growing in the oceanic vat. . . . There are things down there still coming ashore.

(Loren Eiseley, The Snout)

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on gaming

Matthew J. Costello

A recent package of GURPS modules and sourcebooks from the prodigious Steve Jackson Games prompted me to spend some time reading and playing with the latest from the Austin, Texas game company.

GURPS, the Generic Universal RolePlaying System, is Steve's grand, all-encompassing role-playing game, a system that can be used for adventuring in everything from Ancient Rome to the Jupiter Probe Discovery.

The first publication out of the pack, *Conan, Beyond Thunder River,* quickly caught my attention. By now, most people are familiar with the Hyborian hero, if only from the two films starring Arnold Schwarzenegger. At one point TSR, of Dungeons & Dragons fame, had the Conan licenses and produced a full-scale role-playing game and a few adventures. It apparently didn't do all that well, and the license was subsequently free. Enter Steve Jackson Games . . .

Beyond Thunder River is a solo adventure by long-time SJ Games's collaborator, W. G. Armintrout, using the innovative and detailed GURPS rules. The perfect-bound book features a properly barbaric cover by Denis Loubet, a 560 entry solo adventure, combat maps, and character statistics. It also includes a Conan Character Sheet, blessed with Conan's special advantages (such as Combat Reflexes and Night Vision) and his special quirks (Bluntness and Unemotionality.)

I played the adventure with all my critical antennae out. And with good reason. I designed my own first solo in 1983 for SJ Games, "The Thing in the Darkness," a horror adventure that broke new ground. I had always hated solo adventures where you just wandered from place to place, following an ever-branching stream of limited options. In "The Thing," I made it so you could go anywhere in the town of Arkham. And things happened that affected your sleuthing as time went on.

So I looked to see whether this Conan seemed state-of-the-art, maybe even with a few new wrinkles of its own.

Happily, Armintrout has designed a suspenseful adventure, one that I genuinely enjoyed playing. It's based on the Robert E. Howard story, "Beyond the Black River," and it takes its time getting to the action. Your character is a commander of the scouts in Fort Tuscelan, in the Aquilonian province of Conajohara. While at the fort, your character can perform a number of activities . . . check on his/her scouts, inspect the gatehouse guards, leave the fort to scout around.

As these activities are performed, time is marked off . . . with growing tension as night gets closer. Gradually your character hears rumors and is summoned to Valannus, Governor of Conajohara.

(Continued on page 133)

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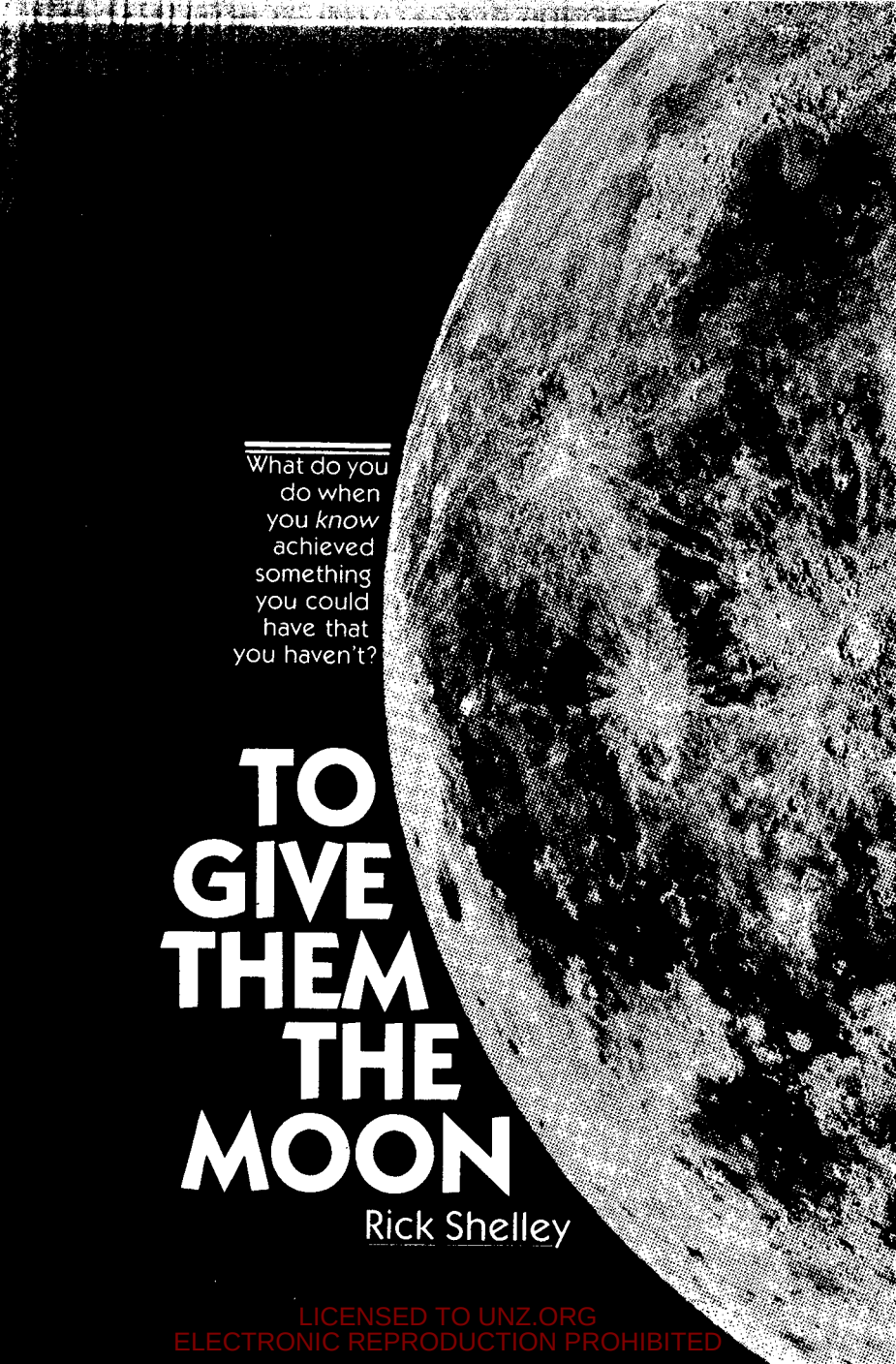

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1.

There were only two things I was certain of when I heard the engine start and saw the gray sedan pull away from the curb. First, I was *not* in my own world. Second, I had never been so damn scared in my life, not even with those two men shooting at me.

Scared? I was so terrified that my bladder almost let go. I started to run, knowing that I couldn't catch the car but had to try. That car and the people in it were my own link to home. The car turned the corner and vanished—*poof*. I ran until I reached the place where I saw it last. The car was gone. Ed Villiers and the son who was, somehow, almost me had marooned me. Standing there in the street, I learned that I had never before known what real fear was: a numbing, paralytic sensation. All I could think of was, *They won't come back for me. They won't come back.*

A car horn honked, right behind me, and I jumped for the curb. The driver leaned out his window and called me a son of a bitch, in French, as he went by. I got to the sidewalk and stared after him, still mostly blank.

Too much had happened, too fast. Since I woke up that morning—whenever *that* was—I had been shot at by two men named Brit and Kole, rescued by strangers who looked like relatives, hustled among several parallel worlds, taken back to my own world to help kill Brit and Kole, and then dumped in this world. All because Brit and Kole, and Ed Villiers and his son Chick, feared that I would somehow destroy my world and a lot of others on July 2, 1993. I remembered the exact date, and most of my alleged future biography. I remembered everything the Villiers told me during our hours together. It was the only guide I had to the insanity that had overtaken me.

We jumped to this world after firebombing Brit and Kole. Ed Villiers told me that we had also jumped forward a dozen years, so I wanted a newspaper right away. I was awed by the idea of time travel. There was a vending machine on the corner. When I went to buy a paper, Villiers and his son vamoosed in the gray sedan.

A newspaper still seemed to be a good idea so I went back to the vending machine. It was one of those glass-front jobs that let you read the top half of the front page. That much was familiar. The paper itself wasn't. It was the *New York Times*, but a French-language edition. In Brooklyn. I saved my quarter. I speak French, after a fashion. I read a bit of it too, but that's more of a struggle, too difficult to waste money on.

Thinking about money, I checked to see how much I had—not much, seventeen dollars in my wallet, a buck fifty in change. Then I realized that I didn't really have *any* money at all. *"If you've got a quarter,"* Ed Villiers said when he pointed me at the newspaper machine, *"it should work."* And we had jumped worlds to buy gas once, just to make sure that the money was right.

I was in trouble, and broke.

The newspaper's lead story was about a speech President Alexandre Lebrun (the name meant nothing to me) made to the first session of the Quebec State Legislature. Quebec had become our fifty-first state on July 2. The paper was dated July 6, 1978. There were also stories about the New York City Metro-

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politan Sewage District and the governor's campaign to make English the only official language of the state on the top half of the front page. The last column started a list of ocean liners departing in the next few days—far too many passengers ships on the Atlantic run, it seemed.

I'm supposed to be smart. I had teachers tell me that as far back as I remember. It was usually a prologue to a reproach that I wasn't making straight A's. School was such a drag that I never did more than get by. But I don't know that paying better attention would have helped me cope in an alien world.

I walked aimlessly for a time. My first stop was a telephone booth. The year-old directory had a listing for an Edward Villiers on McDonald Avenue, where they abandoned me. I didn't expect anything, but I put a dime in the slot—the coin was the right size—and dialed. I got a recording: "The number you have reached is not in service. Please make sure you have dialed the correct number and try again. If you need assistance, dial operator."

"Brother, do I need assistance," I mumbled while the message was repeated in French. Not that a telephone operator would be much help. "I've got to know more about this place." Then I got a brilliant idea. The public library. The telephone book listed a dozen branches in Brooklyn. All I had to do was find one. That took more walking, and asking directions several times.

The library was a pompous little building disguised to look like a Greek temple: colonnades, marble facade and steps, the whole schmear. The foyer walls held facsimiles of historical documents from the United States and France. There were two main public rooms, stacks on the left, reading and reference on the right. I went right. The woman at the desk wore what looked like a Salvation Army uniform but the brass letters on the high collar were NYPL. Her iron-gray hair was pulled back in a bun so tight it drew her face to the sides. I headed for the rack of newspapers before she could ask what I wanted.

I went through a bunch of papers from New York and Chicago, then found a one-volume encyclopedia the size of an unabridged dictionary and browsed through that. I started at U.S. history, then went on at random, totally absorbed. When I heard a gruff voice say, "We close *promptly* at 5:30," I almost jumped through the ceiling. The librarian was standing across the table from me, staring. I nodded, looked at the clock—5:26—then returned the encyclopedia to its place and left.

Outside, on the marble steps, I took several deep breaths. I still didn't know what I was going to do, but I knew a little more about the world. It appeared that it diverged from my world in 1915, maybe a little earlier. In February 1915, Tsar Nicholas took Russia out of the Great European War to deal with his internal problems. There was no mention of Rasputin. The Russian Revolution failed in the face of Nicholas's reforms. With Russia out of the fighting early and the United States never in, the war dragged on until 1933, and ended with the German Empire extending to the Seine. And Paris. Millions of French refugees fled to England and North America.

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I started walking again. It took me a half hour to come up with another brilliant idea. I saw a church. "Churches are supposed to help people," I told myself, so I crossed the street and went into St. Bartholomew's. . . . even though I didn't know much from churches. It was quiet inside, and almost cool. There was no one in the lobby part so I went right into the main section. There was an old guy in a priest's get-up and a funny hat on his head kneeling in the front pew. I heard him mumbling as I walked toward him.

"Excuse me," I said when I got close.

"Can I help you?" His hair was white around the edges of the peaked cap, his face was wrinkled. But his voice was firm and clear, with a light French accent.

"I don't know. I hope so." I didn't know what the hell to say. It wasn't just that I was talking to a priest. A backward world. The only jets were military. No space program. No color TV. The encyclopedia didn't even give Einstein his own article, just a footnote about his 1905 papers in the Physics article—no hint of general relativity or nuclear fission. I didn't know where they went *wrong*, but there were no A-bombs in the world.

"Here, have a seat," the priest offered.

"My name's Charles Treville," I said as we sat.

"I'm Father Monteux. Are you in trouble?"

"I'm not sure. I think I must be."

"Do you want to tell me about it?"

I hesitated. "I'm not sure what's going on. My memories don't agree with what I can see around me." *That* was certainly true.

"I don't think I understand," Father Monteux said.

"Neither do I." I took a deep breath. All or nothing. "Let me tell you what I remember since I woke up this morning, or whenever it was." I told him everything. He was a good listener but I couldn't read anything in his expression. He *couldn't* believe my story. *I* wouldn't have believed it if it hadn't all happened to me. While I talked to Father Monteux, I even started to doubt my memories. It *was* impossible. It couldn't have happened. But it did.

"I see that you're very troubled," the priest said when I finished.

"I don't think it's something simple." I pulled out my wallet, change, and a keychain with five keys. "These are my only possessions, except for the clothes I'm wearing. Tell me, is any of this money real?"

He looked closely at every coin and bill, shaking his head gently the whole time. Then he went through the rest of the things in my wallet—driver's license, student ID from the University of Illinois, social security card, and so forth. "It all looks so real," he said, "but the money isn't even a good copy, except for the pennies—and the back is wrong on them. It wouldn't fool anyone." He squinted at me. "If this birthdate's right, you're thirty-one years old."

"I don't think I'm any older than nineteen."

"Nor do you look older. This is very peculiar."

"What can I do?"

He didn't answer right away. One

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hand clasped the cross around his neck. He looked at the floor, at the altar, at me. Maybe he was praying. If I knew how, I might have prayed myself.

"This is all completely beyond me," he said finally. "Unless it's some macabre practical joke." He stared into my eyes. It was hard to meet his gaze without squirming. "No, I don't think it is." He looked away. "I think you should see a doctor, a specialist."

"A psychiatrist?"

He nodded. "The church maintains a hospital, St. Denis, here in Little France. They do very good work."

"A mental hospital?"

"One of the best. I served as staff chaplain when I was younger. I still help out occasionally."

The idea scared me—a funny farm, a loony bin, nut house. Then I started to think. Maybe it wasn't such a bad idea after all. It would give me room and board, a safe haven while I studied this world and figured out what to do. Surely my story could keep any shrink busy for a while. Since *I* knew I was sane, I didn't see any difficulty getting out when I wanted to. If I couldn't manage an official release, I could always break out. But . . .

"Do they use electroshock therapy?" I asked.

"Of course not!" He looked insulted. "I said it's one of the *best* hospitals. Shock therapy has been illegal for twenty years."

After that outburst, I didn't have the nerve to ask about lobotomies. If shock therapy was out, certainly brain castration had to be illegal as well. But I needed a moment more to convince myself that it was really another *brilliant* idea.

"Can you help me get to this hospital?"

"Of course, my son. I'll drive you over myself, if you like."

"Thank you. There's one more thing. I'm starving. I can't remember the last time I ate." A lie detector couldn't have faulted that statement.

We ate in a house attached to the church. There was another priest, and a nun who served the meal. We had a thick stew with bread, salad, wine, and pudding—plenty of everything. Having a guest didn't faze anyone. Father Monteux did the introductions but didn't say why I was there. The table talk was in French. Maybe I understood half. I was too busy eating to say much, but I answered the occasional polite question, using French until I was stuck for a word. It rarely took long. When the nun started clearing away the dishes, the rest of us went into a sitting room and sat in wingback chairs. The priests continued to talk, including me in everything. It was all very genteel. After thirty minutes or so, the nun came in and we all stood.

"We'll go now," Father Monteux said. "I drive Sister Annamarie home to the convent every evening. I'll take you on then."

The car was a heavy thing that reminded me, a little, of cars made in the early fifties in my world—different, but not *too* different. Inside, everything was in about the same place, but not quite. The car smelled of real leather and sweat. The windshield showed that it had rained recently—the path cleared

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by the wipers was clean, the rest was splattered.

Father Monteux was a careful, and slow, driver. Sister Annamarie sat in front with him. I sat in back. There was no talk while we were driving. The priest concentrated exclusively on driving.

The convent looked more like a warehouse than a religious place. Father Monteux parked in front and escorted the nun to a door. Then he came back to me. St. Denis Institute of Mental Health was three blocks away.

"I'll take you in and introduce you," Father Monteux said. "I know most of the staff. You'll have to sign yourself in as a patient."

"Does that mean I can sign myself out later?"

He hesitated. "Unless the doctors think you present a clear danger to yourself or to the community."

"I don't think I throw fits or anything like that."

"That's comforting." He smiled. "Come on. They're really good people."

We parked in a driveway, against a gate leading into the center of the hospital. St. Denis took up an entire block—a hollow square with a landscaped park in the middle. Father Monteux rang a bell at a side door. It was several minutes before an attractive young woman opened it. She was dressed in a pastel-green hospital uniform.

"Why, Father Albert, come in." She pronounced Albert in the French manner, *Al-bair*. "This is a pleasant surprise."

"Thank you, Jeanne." Her name also got a French pronunciation. "This is Charles Treville. He has some problems."

"Come to the office. Doctor Benoit should be finishing his rounds."

We climbed to the second floor. The stairs were narrow and steep. The office was small and crowded. Along one long side wall, two desks and a table were stacked with loose-leaf folders and clipboards. The other side wall had cupboards and cabinets with a shelf in the middle, like a kitchen. At the back of the office, Jeanne made a right turn into a second room. Father Monteux and I followed. The second room was less cluttered. There was a refrigerator in one corner, and a table with chairs around it.

"Have a seat," Jeanne offered. "I'll find the doctor."

"Courage, my son," Father Monteux said when we were alone.

"Is it that obvious that I'm scared?"

He nodded. "You'll be safe here." That's what I was hoping. It also occurred to me that insanity might save me if anyone did come to nab me for zapping Brit and Kole.

Jeanne came back with a guy who looked like TV's image of the perfect doctor—tall, athletic build, early thirties, tanned, perfect smile. The doctor and priest greeted each other like old friends.

"Bill, this is Charles Treville. Doctor William Benoit."

I stood. We shook hands.

"Hello, Charles."

"Charles came to me for help," Father Monteux said. "I suggested he come to St. Denis."

Benoit smiled, like for a close-up. "That's a good sign. The first step to-

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ward conquering problems is recognizing that you need help."

Oh, brother, I thought. *Corn city. TV dialogue.*

"I've got to go," the priest said, turning directly toward me. "You'll be in good hands here, Charles. And I'll stop by to see you now and then, if you don't mind."

"I'd like that. You're the only friend I've got—that I know of."

"I'll see you to your car, Father," Benoit said. "Jeanne, why don't you fix Charles some coffee or tea. Let him know what to expect."

Jeanne and I both had coffee. She sat across from me and leaned on the table. "It's not so bad here. This is Diagnostic. You could be here anywhere from a week to a month—it depends how long the doctors need to decide just what you need and to set up a treatment plan."

"What then?" The coffee was horrible, but I drank it.

Jeanne shrugged, a gesture that made her look very young. "We've got twelve residential wards for men and outpatient services. The only places it gets rough are on the behavior wards, where they put violent patients." That sounded like a warning.

Doctor Benoit was gone twenty minutes, so I assumed that Father Monteux briefed him. The doctor took me to a private office with diplomas on the walls and photographs on the desk. There was no couch, though. We both sat in easy chairs. I gave the doctor my wallet and change and told him exactly what I told the priest.

It was the next morning before things got hectic. There was a lot of paperwork connected with my formal admission. I signed myself in. Photographs were taken . . . as were fingerprints, detailed physical measurements, blood, urine, and stool samples. The physical took two days, and it made my draft physical look like a joke. Mostly though, I told my story to a series of doctors. I told it straight, drugged, hypnotized, connected to a lie detector, and in various combinations of those. From the core story of my "exciting" day, the doctors led me to earlier memories. The more they dug into my past, the more excited they got. I guess none of the shrinks had ever seen such thorough "delusions." The more I talked, the more I remembered. Some of it surprised me. My father died when I was four. I'd never been able to recall much about him before, but early memories started to surface. Remembering the day my mother told me he was dead brought wracking sobs and a lot of pain. Maybe for the first time. I didn't understand death when I was four.

Then there was the nightmare. The doctors loved that. It started my first night in the hospital, my first night in the world, and I had variations of the same dream almost every night afterward. In the dream, I was back in Urbana, standing behind the Illini Union, talking to a crowd about the evils of our involvement in southeast Asia. The crowd got excited and started to chant, wave signs, and march around. Gradually, I realized that they were protesting *me*, not the war. The people became a mob of vague Brits and Koles. They formed a firing squad. Ed Villiers commanded the executioners and Chick stood by to administer the coup de

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grace. I woke with the sound of gunshots. . . .

My "workday" on Diagnostic was from nine to four, with an hour for lunch. The day was totally regimented from morning wake-up through supper, but there was a game room and a television that patients could use in the evenings. I learned that there was a library in the hospital. Once I got to a living unit, I would have regular access to books. In the meantime, an aide on the afternoon shift got me a couple of volumes. I had a lot to learn about my new world. On my fourth day at St. Denis, a social worker explained my rights and told me that I would receive a monthly stipend, initially pegged at sixty-seven dollars—the minimum—because they hadn't determined how much I was actually entitled to.

"You mean you can't find any record of me," I said.

"Not yet, but it's just a matter of time."

I almost wish that was true, I thought. I envied some of the patients who were genuinely crazy. They didn't have any worries at all.

"We'll find your records soon, and your family. The Department of Social Welfare is thorough and very efficient. We can count on the full assistance of every official agency in the country. We always succeed."

I didn't pay much attention to the spiel. I was thinking how nice it would be to have "real" money again. There was a small store for hospital residents, and there were vending machines. Later, I learned that I wouldn't get all sixty-seven bucks of that allotment. The hospital was permitted to deduct ten percent for my treatment, room and board. I also had to pay for the "complete wardrobe and accessories" I was issued. All my old stuff had been taken away, right down to my socks and underwear. And the new clothes—they were no great shakes, but they would do—had to be paid for out of my monthly sixty-seven dollars. At least the hospital would spread the fifty-two dollar clothing tab over six months. I didn't expect to be a patient that long. I hoped I wouldn't be.

But it wasn't bad for the moment. Day by day I felt smugger about my brilliant idea of hiding out in a loony bin. After two weeks I was even fairly comfortable living in Diagnostic. I even conducted a mild flirtation with Jeanne—harmless stuff. Nothing could come of it, of course, not while I was officially crazy. I wasn't surprised that I was on Diagnostic so long. My case was probably unique. The doctors kept asking about my memories and I kept talking. They didn't bother me. Neither did my occasional clash with insanity.

There *were* crazy people around me.

A middle-aged resident accosted me in the TV room after supper—near the end of my first week in the hospital, I think.

"I'm the Man in the Moon," he said, pushing right up against me. His breath was unbelievably rank—like an outhouse in August. "You'd better be nice to me." I backed off but he moved right with me. "If you're not nice to me, I'll do what I did to Lenny." Lenny was an emaciated man in his seventies who spent most of his time sitting on the edge of a straight chair rocking back and forth. "Lenny wasn't nice to me so I

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sprinkled moondust all over Lenny and now Lenny eats shit."

"You may be the Man in the Moon, but I'm Old Man Sun, so get lost before I burn you to a cinder," I said. I growled at him a couple of times, too. That worked for the moment, but the next day the Man in the Moon was back and we went through the same routine. But he was the only one who gave me any headaches, and he was only around for four days. I had to hold myself in to keep from punching him. There *were* those wards for violent patients.

Most of the time, I had the easy life. I even put on a few pounds, enough to blunt a few of the sharpest edges. I had always been skinny—embarrassingly so in high school. I promised myself that I would start exercising when I got to a regular ward so I would be fit for whatever came after.

I didn't dream that I would never get to a regular ward.

2.

They came in the evening, between supper and lights out, perhaps about eight o'clock. I wasn't sure. I didn't have a clock in my room. Jeanne came to warn me. "There are two men to see you." She was quite agitated, and that surprised me. I hadn't seen anything that could rattle her on the ward.

"The Villiers?" I had a lump in my throat or thereabouts, a new fear. Had they actually come back for me?

"FSP agents," Jeanne said.

That was worse. I didn't know much about the Federal Security Police, just enough to be terrified. According to Chick Villiers, Brit and Kole had identified themselves to his father as FSP. By the time Chick told me that—and told me what was going on—we had also seen Brit and Kole posing as Urbana cops in their attempt to get me, so Chick guessed that maybe they weren't FSP either. "What the hell's the FSP?" I asked Chick. He told me what the initials stood for and added, "I guess they're somewhere between the FBI and the KGB, closer to the KGB." The library in Brooklyn hadn't added much to that. The FSP was formed in 1921 to deal with Wobblies and with alien agents trying to violate U.S. neutrality laws. It absorbed the FBI and Secret Service, became part of the new cabinet-level Department of Security in the late twenties. The encyclopedia hadn't been very informative about the modern workings of the agency though.

Now they had come for me.

"Can you get me out of here, Jeanne?"

She shook her head. "Not a chance. Sorry. I just wanted . . ." She looked down the hall toward the office. "Whoops, I've got to go." She hurried toward the TV room.

Doc Benoit was with the FSP agents when they came to my room. The doctor looked mad as hell. "Charles, these men are from the Federal Security Police." The anger was in his voice, too. "They have a federal warrant to take you in for questioning. I can't stop them." The last was apologetic.

"You'll come with us," one agent said. "My name is Roy Jennings. My partner is Jack Devlin." Both had the weathered skin of men who spend a lot of time outdoors. Devlin had a dark tan that couldn't disguise the scores of gaping pockmarks on his cheeks.

"My name José Jiménez," I said.

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The FSP agents looked at each other, then at the doctor. Benoit almost smiled. "Where are we going?" I asked. I didn't get an answer. Jennings gestured for me to get up.

"I am sorry about this, Charles," Benoit said.

Who knows? Maybe they can help me find my past." It sounded awfully weak to me, but Benoit nodded before he turned on Jennings.

"Charles is still a patient of St. Denis, legally entitled to certain protections, even in matters touching the FSP."

Jennings gave him a cold look. "Don't get in over your head, Doc." Then he transferred the look to me. "Let's go, Treville."

I looked around my room. There was nothing to fuss over, certainly not my hospital-issue clothing. "Will you make sure my library books get back?" I asked Benoit. He nodded.

Doc Benoit led us down to the side entrance I had come in through. He unlocked the door and held it open. "Good luck, Charles," he said with a finality that admitted he didn't expect to see me again.

The FSP men had a car in the drive, a gray four-door sedan, not too different from the Villiers's car—on the outside. Jennings opened a rear door and said, "Get in." I got in on my own before he could cram me in. There were no extra controls or gauges on the dashboard. A brief hope, or fear, died. It wasn't a device like the Villiers's car. Then I noticed that there were no inside handles on the rear doors. When Jennings slammed my door, I was locked in.

"Where are we going?" I asked as Devlin backed the car from the drive.

"For a ride," Jennings said. I hoped that didn't mean what it meant in my world.

We crossed into Manhattan and went north, ending up in the center of another hollow square building like the hospital, at the north end of Central Park. This building was much bigger than the hospital. The paved courtyard was brightly lit. The windows were barred to the seventh floor. It was a jail and made no bones about it. Jennings opened my door. He and Devlin each grabbed one of my arms and hustled me toward a steel door. Maybe they thought I would try to run away. Maybe I would have, if there had been anywhere to run.

Devlin pressed a buzzer. A uniformed guard looked out through a peephole, then opened the door. He was carrying a short-barrelled shotgun, ready to use. The muzzle looked about a foot wide. We went down a short, wide corridor. To my left there was a barred window with thick, green-tinted glass—bullet-proof, I guessed. A guard behind the glass watched us closely. We went to a blank door at the end of the hall, past blank doors on both sides. Jennings and Devlin still held my arms. The shotgun followed us. Devlin pushed another button. The door opened, into an elevator. There was another shotgun-toting guard inside. The first one stayed behind. The elevator went up. When it stopped—too quickly—Jennings and Devlin marched me out. We left that shotgun and picked up another. The whole business was extremely intimidating—as I imagine it was intended to be. We went through another door and guard change. The

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corridor turned left. So did we. The next interruption was a gate of heavy jail-type bars. Another guard change. Thirty paces beyond, Jennings stopped me in front of room 579. Steel door, heavy metal bar, one-way peephole. The guard opened the door. Jennings pushed me through. I turned around when I heard the door slam. Not one word had been spoken in my presence since Jennings said, "For a ride," as we left the hospital. And Devlin hadn't spoken even at the hospital.

I was alone in a cell five feet wide and ten feet long with a bunk, sink, and toilet. The walls were concrete block. Everything in the cell but the two-inch thick mattress and the single blanket was metal. The mattress felt like it was stuffed with wood shavings. The blanket was coarse wool, itchy as hell. There was one window, high and narrow. The sill was at chin level. The window was barred and covered with wire mesh. By stretching, I could see a little of the parking lot in the center of the hollow square.

"What kind of questioning is this?" I asked. I didn't care if anyone heard me but I wasn't ready to make a big fuss. I could have banged on the door and screamed like in the old prison movies, but I doubted that it would help. I was glad I had had a big supper, back "home" in the hospital.

It was a long night. I paced and counted concrete blocks. I lay down but was too nervous to stay down for long. The light dimmed, leaving just enough to see where everything was. Few sounds reached me. There were no clanging doors or echoed footsteps in the corridor. When the silence got to be too much, I'd flush the toilet or run water in the sink, just to hear something. Getting to sleep was a problem, but it always is for me. I can't turn off my brain at night, even under the best of circumstances. Of course, once I *do* get to sleep, I have just as much trouble waking up. That night, the firing squad dream had a prologue. I was standing in empty space, looking at the world and at a wire leading from it to a detonator between my feet. I shoved the plunger down. The world exploded. Then, like a series of instant replays, a bunch of worlds blew up, one at a time. Later, I dreamed of when I was very small and bitterly angry that daddy wouldn't be coming home any more. Death didn't seem like a very good excuse, not for a long time.

When I woke, I was sweating and trembling, still caught in the last dream. But there was light outside my window, a new day. My stomach was growling before Jennings and Devlin arrived.

"Let's go," Jennings said.

"I hope it's breakfast," I said, but I didn't get an answer.

We went up. Again, we had a uniformed escort, changed each time we passed a door or gate. The room we ended up in was larger than my cell. The only furnishings were a table and three chairs. Devlin sat at one end of the table and took a notebook and pen from a pocket. Jennings sat me at the other end. Jennings didn't sit. He was a pacer—as I am, when I get the chance.

"We have a few questions," Jennings said.

"Me too, like, 'When do I eat?' "

"What's your name?" Jennings asked.

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"Ham and eggs, fried potatoes, toast with jelly. Coffee, black."

"Your name?"

"I'll settle for Cheerios, milk and toast." I didn't consciously decide to play the smartass, but I had to do something.

"Your name?"

"I'd prefer a sirloin steak and two eggs over easy." I wondered how long it would be before they started hitting, or told me when I would eat. That's all I really wanted, some promise of food. I was *hungry*. And scared.

"Your name?"

Jennings's voice could have been a recording, mechanical, emotionless. Devlin just looked endlessly patient. I still hadn't heard *him* say a single word. He just stared at his notebook. I lost track of how long the routine lasted. Finally, Devlin put away his notebook and pen and stood. Jennings told me to get up. They took me back to my cell. I didn't eat all day.

But the next morning, I got breakfast in bed—in my cell, at least, and the only place to sit was on my bed. Cold scrambled eggs, stale bread, and coffee that would have been called "cruel and unusual punishment" in my world. I finished everything. Later, Jennings and Devlin took me back to the interrogation room. Devlin sat and got out his pen and notebook. Jennings sat me down and started pacing. Just like before.

"Your name?" There was still no emotion in Jennings' voice.

"Charles Treville." I had made my point. So had they.

"Date of birth?"

"January 1, 1947."

"Place of birth?" We worked through my life in a linear, orderly fashion—each place I lived, each school, everything up to the day I met Ed Villiers and his son. Jennings wanted names, addresses, and descriptions of relatives, teachers, employers, and friends. Devlin made some notes, but not nearly enough, so I figured that there had to be a recorder concealed somewhere. When I got back to my cell late in the afternoon, supper was waiting.

That routine lasted for three more days. Jennings led me through everything I told the doctors at St. Denis. Sometimes we veered off in a new direction. On the fourth day, he started probing my knowledge of computers, jets, transistors, and other technological devices. I answered as best I could. I didn't know many specifics, but it was clear that the general public knowledge of my world was ahead of the most advanced knowledge of this one.

"We were within a year of landing on the Moon," I volunteeered in response to some question about rockets or weapons.

"Men on the Moon? That's crazy." The first words I heard Devlin say.

"President Kennedy promised to put Americans on the Moon by 1969. We were way ahead of schedule. The day I was shanghaied, we had an unmanned Apollo mission in orbit around the Moon."

"That's crazy." The last words I heard Devlin say.

"Well, just remember where you found me," I snapped. That was the end of that session.

Still, the next day, all Jennings wanted to hear about was our space program. Devlin kept quiet but he had trouble

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keeping the emotions off his face. I didn't know what else to do, so I told the truth, in as much detail as I could. I talked about *Sputnik* and *Muttnik*, our catch-up and go-ahead—*Mercury, Gemini, Apollo*—the way the public didn't give a damn about space until the Russians put up the first satellite and we were suddenly behind in a race nobody realized we were in. I could only recall the names of six of the original seven astronauts, but I mentioned von Braun and Goddard, and the way President Kennedy met with the crews of each mission when they got home. Once I got talking, there weren't many interruptions.

I confused Devlin and Jennings—obviously. Devlin really believed I was crazy, ranting, but Jennings seemed to hang on every word. That world was a long way from space travel—a long way from even accepting the possibility, to judge by Devlin's outburst.

I had a lot of time to think about that without coming to any sensible conclusions. I didn't leave my cell for two days. I ate regularly, but neither Jennings nor Devlin showed. On the third day, I had breakfast and lunch before they appeared. We didn't go to the interrogation room this time. Instead, we went down to the second floor, then halfway around the block. The second floor was mostly offices—the parts I saw. Some of the doors were open, so I got to see some different people, most of whom were careful to avoid making eye contact with me. It didn't make me feel very welcome. Finally, we took another elevator ride down—too far to be one floor. I wondered if I was headed for the dungeons—or to an execution. With Jennings and Devlin at my arms and a shotgun behind me, there wasn't anything I could do about it—except maybe age a couple of years for every step.

"In here." Jennings turned me toward a door. We went in, just the three of us. The guard stayed out in the corridor. It wasn't really a room, more like a booth at one side of a room. The part we were in was barely big enough for a row of chairs. The top two-thirds of the wall separating us from the rest of the room was glass. My guardians sat me down and took the chairs on either side. There was a stage twenty feet away, beyond the glass. The wall behind the stage was marked with lines and numbers—a line-up room, just like on TV.

"We want you to look at some people and tell us if you recognize any of them," Jennings said.

"Whatever you say." I was too startled to question him. This wasn't what I was expecting. I thought I was on the other end of the process.

A uniformed man took his place at a lectern in the corner beyond the glass. Six men filed onto the stage. One by one—at the instructions of the man at the lectern—the men stepped forward, turned to show a profile, again for a rear view, again for the other profile, then faced front before stepping back into line.

"Sorry, I don't recognize any of them."

Another group followed—there were six in all, men and women. In the second set, I spotted my high school physics teacher. In the third, an old woman who looked remarkably like my paternal

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grandmother—my *late* grandmother. A professor from the U. of I. was in the fourth; another in the fifth. I felt dizzy, wondering how the FSP had got those people from my world. If they could do that, they could ship me home to face trial for killing those two guys. *They could ship me home!* The anomaly of the woman who couldn't be my grandmother didn't register at first. It took quite a while to realize that these people had to be their world's analogs of people I knew, people I had mentioned in the questioning. Maybe the others, too. It was a frightening parade.

By the sixth set, my hands were shaking violently. I was sweating but my mouth was dry. My heart pounded against my Adam's apple, turning it to applesauce. I watched the men in group six. At first, none of them looked familiar. After the last finished, Jennings asked, "Well?" I wasn't sure and said so. I looked from one man to the next across the stage. There had to be at least one person there I should recognize. Maybe all six.

"Could I see two and five again?" I asked. Jennings whispered into a microphone. The man at the lectern had those two repeat the routine.

"I'm still not positive," I said. "I didn't get that good a look, but those two look something like Brit and Kole, the men who tried to kill me in Urbana. I never knew which was which." The nightmares didn't help either. Those images were always fuzzy.

"OK," Jennings said softly, "let's go, Charles." The first name was new. When we left, there was no shotgun at my back. I didn't have a hand holding each arm. Jennings and Devlin stayed close, but somehow my status had changed.

We took the elevator to the top floor. A short walk brought us to room 917. Jennings opened the door and gestured me inside. "You'll be staying here for the time being." Both men followed me in, though Devlin appeared uncomfortable at the whole idea—whatever the idea was. I still didn't have a clue. The room wasn't a suite at the Palmer House, but it was worlds better than 579. It was more than a room, more like an apartment. There was a living/dining room, a bedroom, and a fully-equipped bathroom.

"There's clothing in the dresser and closet," Jennings said. "Toiletries and the other things you'll need." Then he and Devlin left, leaving me to wonder at my new surroundings.

The windows—one in each room—were larger and lower, unbarred, but they still looked out over the inner courtyard. There was a table with two chairs, magazines and newspapers in a rack—current. The bedroom had a dresser and a real bed with comfortable mattress and complete bedding. The dresser had socks, underwear, towels and washcloths. A closet held slacks and shirts. Three sets of everything. The rest of the stuff was on the counter next to the bathroom sink. I brushed my teeth, showered, and did the rest of my grooming—a luxury after my days in 579. I had just dressed—the clothes fit perfectly—when supper arrived. The quality of the food increased with the change of address, but I still got indigestion. It was still a jail.

The next morning, Jennings and Devlin escorted me to a large conference

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room down the hall. There were seven easy chairs arranged in an arc with an eighth chair set off by itself, facing the others. I didn't need a program to know which was mine. I sat in it. Five of the other chairs were already occupied. Devlin and Jennings took the last two, at the extremes of the arc.

"This is Charles Treville," Jennings said.

The men I had fingered as Brit and Kole sat next to Devlin. Two more men in civilian clothes sat by Jennings. The man in the middle was in uniform. If three stars meant the same as in my world, he was a lieutenant general. They all stared at me.

"Do I get introductions?" I asked, carefully. Jennings looked to the general, who nodded. Jennings started with the man at his own left.

"Eugene Dexter, FSP director. Thomas Mantoan, head of Research and Development, Department of Security. General Horace Black, Deputy Secretary, Department of Security. Andrew Kole and Harvey Brit, FSP."

Neither agent looked like he had been through a firebombing.

"I've never seen him," Kole said.

Brit echoed the statement, then added. "This is the nut who says he killed us?" The voice was harsh, angry. Brit was a little shorter and heavier than his partner.

"We'd like to hear your story," General Black said, "everything that happened to you the day you signed yourself in at St. Denis. In detail, if you please." The phrasing was polite, but the tones were those of a general giving orders.

I looked around the arc. "I take it this means that you've decided that I'm not crazy, that my memories aren't delusions?"

"For the moment, take it any way you like," Black said.

"I was a sophomore at the University of Illinois at Champaign-Urbana, and I was head of the campus chapter of StEP, Students for Eternal Peace. We had a demonstration planned to protest the government's involvement in the war in southeast Asia."

"An illegal protest?" Brit asked.

"No, we were simply exercising our right to free speech and peaceful assembly. Why, is the *Bill of Rights* dead here?" Having Brit and Kole present grated. Maybe my anger was a cover for fear. I *knew* I had helped kill them—there was no way they could have escaped and not known about the attack—and I don't believe in ghosts.

"Free speech is no license for subversive agitation," Brit said.

"Enough!" Black said. "Let him talk."

I talked. I told them everything from waking up in my Urbana to entering the hospital in their Little France. I told it just the way it actually happened, with me deciding that feigning insanity was the sanest thing to do. When I finished, there was a long silence before Black spoke.

"Thank you, Mr. Treville. I'd like a few words with you after this meeting."

"Yes, sir." As if I had a choice.

"Thank you, gentlemen," he told the others. "Dr. Mantoan, perhaps you should stay." The rest left. I felt a little less uncomfortable.

"I've lost a lot of sleep because of you, Treville," Black said. His voice

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got less military with fewer of us around.

"You *have* decided that I'm not crazy."

"Provisionally, shall we say." He steepled his fingers at chin level. "There are some circumstances involved that don't have easy explanations."

He wasn't telling me anything I didn't know. Not yet.

"Last October 21, there was a shoot-out between New York police and bank robbers at the address where you say you were abandoned. There were Villiers living there then. Villiers's wife and two oldest children were killed—innocent bystanders. Villiers and his younger son, Charles, disappeared—either two days or a week after the funeral. We have conflicting reports, both of which are definite. Edward was seen in Little France and in Arlington Heights, Illinois, within a span of fifteen or twenty minutes. Impossible but irrefutable. In Illinois, he was driving a gray sedan. His own car was abandoned on Flatbush Avenue in Little France, towed away, and never reclaimed.

"You correctly identified some of the people you talked about. None of them recognized your photos from St. Denis. None recalled any Charles Treville. Those who should have had physical evidence, like grade books, didn't. Your clothing wasn't manufactured here. Finally, there is no record of you in any official documents, federal or state. Your fingerprints don't match any birth certificate, school enrollment, driver's license, voting or employment register, or immigration records. You have no military, medical, draft, or criminal past. You've never been in a hospital or had a parking ticket, or bought anything on credit. You don't exist. You couldn't exist without leaving some trace." There was no doubt at all in his voice. It wasn't until later that I really started to grasp the implications of some of the things that he had said.

"What happens now?" I asked. I was a non-person. I couldn't remember what book I had seen that concept in. Something scary.

"That depends entirely on how cooperative you are."

I looked at the general. It felt like I was blinking continuously, but that must have just been my imagination.

"I'm in exile here," I said slowly, trying to keep my brain ahead of my mouth for a change. "I know very little about your world. I don't see any chance of getting back to my own world and damn little future if I could." I snorted, thinking of the charge that I would become a militaristic nationalist who would somehow instigate Armageddon. "I was dumped here for a crime a few people thought I would commit in the distant future. None of those people were even *from* my world. There, a person is considered innocent until proven guilty in open court, with every chance to defend himself." Sure I could get mad about it—especially after my sojourn in the FSP prison—but I couldn't do much about it.

"Why shouldn't I cooperate?"

The general didn't bother to answer.

"If it's details of technology you're looking for, I won't be of much help, but if it's general knowledge of what my world has that this one doesn't, that's different. I've already talked a lot

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about that. There's no reason why I should stop now."

The general glanced at Mantoan, then over toward the windows. Black drummed his fingers on the arms of his chair.

"I've been a soldier for twenty-eight years," he said finally. "The recruits entering the service today train on the same rifle I did, on the same rifle my *father* did, a Winchester thirty-ought-six autoloader. It's a good weapon, equal to any primary military rifle in the world, maybe a tad more reliable than most. But it's not the best we could have. It's not even the best Winchester makes today. They've been trying to sell the army a newer, more modern weapon for twenty years. But we're not buying. I could go up and down the list of munitions and equipment." Black paused again. I couldn't think of anything more intelligent than, "So?" to say, so I stayed quiet.

"We make some progress, but there's not much incentive. Money is needed for other things. We have to have social programs because the German Empire has always had the best social programs—all the way back to Bismarck. In the military, the big money goes to the Navy—all that 'first line of defense' crap they spout." A longer silence.

"Do you have any idea what it's like to be a professional soldier in a country that hasn't had a *real* war in more than a century, since the Civil War? Forget Indian wars, the Spanish-American War, the puny campaigns in the banana republics. I mean a real war like the Great European War."

I shook my head, just to be contributing to the conversation.

"Garrison soldiers are a joke. If we didn't take ourselves seriously, no one would. About the only way to become famous is to do something so heinous that people are scandalized. Even presidents have to struggle to find something the history books will find worth mentioning. Wilson kept us out of the Great European War. Since then, it's just been, 'Me too.' "

"I don't see where this is leading, General," I said.

He leaned forward. The glint in his eyes may have been my imagination, but I don't think so. "We would love to put Americans on the Moon."

After all the interest Jennings showed in our space program, maybe that shouldn't have been a surprise, but it was.

"If you can't get new rifles, how do you expect to sell a trip to the Moon? Back home they said it would cost 24 billion dollars. I don't know how the money translates, but newspapers were a dime, not a quarter."

"I came here this morning from Washington, from the White House," Black said. "The president has read the transcripts of your interviews, seen the reports of the FSP investigation. We discussed your space program several days ago. Our conclusion is that if it's possible, the German Empire is likely to do it, and that is a clear and present threat to our national security." His voice softened and he looked away as he added, "Just once, we'd like to be first at something. The president wants to be in the history books." Then, almost in a whisper: "And so do I." The general cleared his throat, looked at me, and said, "Once we show that it's pos-

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sible, the money will be found," very gruffly, as if to make up for showing human frailties.

I stood and walked to one of the windows and stared out. The conference room faced a broad avenue and Central Park. There were cars down there, and free people. *The Moon he wanted.* Like most kids my age, I grew up with the idea of space travel. I watched the launches on TV, followed the missions and the space news in between as diligently as I followed *Peanuts* and *Alley Oop*. Orbital speed, escape velocity, Titan, Saturn. I thought of DynaSoar, the winged spacegoing airplane. Maybe I *could* provide enough clues to let real scientists do the work. At least the general wasn't asking for nuclear weapons.

"What's in it for me? I won't work as a prisoner."

"I wouldn't expect you to." I turned toward him and stared. I didn't have any trouble deciding, and that bothered me a little. The rabblerouser going to work for a government that appeared distressfully authoritarian? Where was the philosophical conflict? Why wasn't I screaming my outrage?

What the hell, I thought, *where did outrage ever get me?*

"Make me an offer, General." He stood up and crossed to me. Black was a little shorter than me, but must have outweighed me by thirty pounds.

"You'll be special assistant to Dr. Mantoan here until we get the project running, then you'll be project director. Shall we say at fifty-two thousand a year?" He paused. "Since you seem uncertain about money, let me say that that will put you in the top ten percent of government employees. We provide a furnished house at nominal rent. It *is* on a military reservation, but that's where the research center is. The facility is high-security, but it's not a prison, and you won't be a prisoner."

Maybe not, but I assumed they would keep a close watch on me. I thought about it for all of ten seconds. My heart was pounding wildly when I said, "OK, General. I'll give you the Moon. If I can."

We shook hands and I left prison a free man, more or less. When we drove away, I had nothing but the clothes I was wearing. Again. In forty-five minutes, I was aboard a military plane, flying to Washington with the general. That night, I slept in a fancy suite at the Watergate Hotel. When I checked in, my "luggage" had already been delivered, more clothes—all new—than I had ever owned at one time in my life. Quality stuff. I also had money. Cash. The general backdated my employment to the day I arrived at St. Denis. And yes, I did have my share of freedom, right from the start. I tested it that first evening by going out for supper and a long walk. Nobody tried to stop me. Oh, Jennings and Devlin were in sight, but they didn't try to tell me what I could or couldn't do. It was a good start.

That's what I told myself.

But that night I had a new nightmare, for the first of many runs. From some outside vantage, I saw Earth. While I watched, the planet grew a bud that became a second Earth. The worlds stretched apart, connected only by a constantly-thinning band, like taffy being pulled, or chewing gum. I started to fear catastrophe if the strand broke. Then, somehow, *I* became the connection

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holding the worlds together. I felt myself stretching to the breaking point. The man who was condemned for destroying all the worlds became the only one who could save them.

I woke with the sound of a brittle snap.

3.

I was officially thirty-one years old. My new papers accepted my old date of birth. And, on the basis of what I had already said about our rocket program, I was awarded a Ph.D. in Physics from the National University—not an honorary degree, the real thing. I even earned it, if not in advance, then during the next couple of months.

General Black kept me busy. It felt like cramming for finals day after day, week after week. Everything went so fast that my memories of that period are all jumbled together. Think of it as watching a movie with a complicated plot—made worse by a mad editor who had chopped the entire film up into five-minute segments, then spliced them together any-which-way.

I read textbooks and made notes, then I answered questions from government scientists on my commentaries—written queries in most cases, though occasionally I had face-to-face meetings. My freshman courses in physics and chemistry made me as much of an expert as any of the scientists, at least on the theoretical level. Transistors were a military secret. Jet airplanes were just beginning the transition from weapon to commercial carrier. Computers needed vacuum tubes, miles of wiring, and gymnasium-sized layouts. The uncertainty principle was either unknown or ignored. The atom had never been split. It was still officially "impossible." I couldn't be sure that all my "updates" were accurate, but that scarcely mattered. Even my mistakes had to be steps in the right direction for a world and country that had spent the last sixty years worrying more about spies, saboteurs, and displaced persons than technology. The Great European War hadn't produced any great advances beyond radio, the tank, and airplane. That war had been too debilitating for the countries involved, and there had been no major conflicts since to spur military invention. And, feeling secure behind broad ocean bulwarks, the United States hadn't done a lot more. A strong navy, a strong army, both equipped with conventional weapons, were seen to be enough.

Inevitably, I would change that. I hoped that progress would take a slightly different course. My nightmares said it wouldn't.

At the beginning, I spent two weeks in Washington becoming an "official" person and starting my work. My office was the suite in the Watergate. Books were carted in for me to work on when I wasn't somewhere getting my picture taken or something like that. I came and went as I pleased when I wasn't working, and I tried to see some of the tourist sites. I had never been to my Washington, and a lot of it was the same. There was only one major irritant.

"Am I going to have shadows following me the rest of my life?" I asked Black after three or four days. Jennings and Devlin were spelled by Brit and Kole and another team. They were at

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my door when I was in the hotel room. They followed me everywhere else.

"Not forever," Black said, glancing at the current team. "Right now, you're too important to take chances with. We don't want strangers spiriting you away."

Come to think of it, neither did I.

Things got a little less cluttered when I moved to the Center for Research and Development. That was in southeast Kentucky, in the London-Corbin area. It wasn't a fancy place or particularly busy, but as long as I was on base, I didn't need a watchdog at my heels.

It was an old army base, with tan, wooden barracks and office buildings. Dust all over the place. The day I arrived, there were platoons of GIs out raking the dirt.

The major activity at the Center was "routine performance testing" of weapons that had been in the system for years—hardly what I thought of as research and development. The experimental work was mostly aimed at minor improvements in existing technology. When I arrived in mid-August, I was an instant big-shot with a corner office in the headquarters building and a six-room house in the residential quarter—the newest part of the base. Both office and house were close to Dr. Mantoan.

Tom Mantoan was a small man who squinted a lot even though he only wore glasses for reading and close work. He was quiet and subdued. Only when he got into something he was deeply interested in did he lift out of that mold. We had daily conferences in my early weeks at the Center, laying down plans for Project Apollo and bringing him up to date on science in my world. He spent a lot of time lifting eyebrows at what I told him, but he did have scientific training. Not once did he say, "That's impossible!" or "That's crazy!" and that impressed me. He was easy to be around.

On October 2, a Monday, we met in the Officers's Club after work. I had white wine. Mantoan had scotch and water.

"Congress started the fall session today," Mantoan said. "Our new appropriation went through the House this afternoon. It's in the Senate now. President Lebrun will sign it tomorrow morning."

"Is it that cut and dried?"

He smiled. "After the intelligence briefing, it's just a formality. It has the seal of the Department of Security." That was the local equivalent of the Defense and Justice Departments combined, and it had a finger in everything else. The briefing was a small item that appeared in the weekly intelligence summary that the FSP provided for limited circulation within the government. It reported a "rumor" that the German Empire was ready to embark on a crash program to militarize space. . . . and so forth.

"When do we see a difference?" I asked.

"Tomorrow. The requisitions for personnel and equipment are already out. General Black has been interviewing people for a month. The first construction contracts will be signed as soon as I get the call that the president has signed the bill. Surveyors will start working immediately."

"The general's doing the hiring? I thought you'd do that." Black was no

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scientist. He was the number two man in the Department of Security.

"I told him who we want. He's doing the talking."

I got the picture. College professor is summoned into the presence of one of the top government officials. *"I want you!"* Not Uncle Sam, Uncle Horace.

I shook my head. "People who come here against their will won't do the level of work we need."

"I don't know where you get your ideas. This isn't a police state. We don't force people to work against their will."

"You just make them an offer they can't refuse."

"Exactly." Mantoan clearly didn't attach the same meaning I did to that.

"We should have your top people in this weekend. General Black thinks you should give them an orientation talk Monday—tell them what we're going to do. They may have guesses, but they don't know any details."

"Do I tell them I'm from another world?" I meant it as a joke but Mantoan took it seriously.

"I don't think so. It's enough that they're assured that we're not asking the impossible. They have to produce a program that another government has shown to be clearly possible."

"And they'll assume it's the German Empire," I said.

"You did say that both the U.S. and Russia depended on German scientists in your world."

"And all we've got is me. We needed ten years from the first artificial satellite to men on the Moon, assuming there were no hang-ups in the year after I was shanghaied. We should be able to cut that time."

Mantoan shook his head. It wasn't the first run for this kind of conversation. "You had an active rocket program already. We can't even match the V-2."

"We should still be able to skip some steps."

We finished our drinks and I walked down the street to the Post Exchange. Project Apollo didn't officially exist yet but we *had* come a long way. Investigators had found a number of papers in math and physics that mainstream science had ignored. They weren't necessarily ones we needed to get to the Moon, but there was more to my work than that. What we needed was the pioneering work of people like Robert Goddard—if he did any in this world. The FSP hadn't found anything yet. They were still looking.

My shopping basket was full when I reached the PX check-out counter.

"Will there be anything else?" the cashier asked with her usual grin.

I looked at what I had. "I didn't think I had *this* much. Want to help me carry it home?"

She laughed. Her red hair bounced. "I don't get off till eight, or I might." Her name tag read Caroline Donat.

"I'll have to time my shopping better. You ever get off early?"

"Six o'clock tomorrow."

"There's a new movie at the base theater if you'd like to go."

The movie was a comedy reminiscent of Jerry Lewis's solo work. I thought it was OK, but Caroline thought it was a scream. I was still missing some of the local humor. I saw every movie possible, but I was having trouble getting

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used to all the strangers on screen. Sometimes I saw a familiar face, but most of those were in old movies on TV, people who started in show business before our worlds split, or soon after. There were *some* familiar people from later eras, but usually with different names. For example, a guy who had to be the analog of Bob Hope was doing small character bits in other stars' movies.

Caroline was nineteen. Her father was a major due for promotion to lieutenant colonel. Caroline accepted my statement that I worked at headquarters without question, but the next time we went out, two days later, there was something different—inhibited—about her attitude. She kept glancing at me when she thought I wouldn't notice.

"Let me guess. You mentioned me at home and your father told you what I do," I said. Her eyes got big. "Nothing to worry about. It doesn't change me. If you'd asked what I do, I'd have told you. I didn't think you'd be interested. Or maybe I thought you wouldn't believe me."

"Not my father. A friend said you're some hot-shot genius who's going to turn the whole place upside down." She tilted her head to the side. "*Are* you going to turn everything upside down?"

"Things should get lively."

"That means change. How can I know if I'll like it?"

In a way, that's the main difference between here and there.

Change. I guess I changed a lot myself. My life passed out of my hands the minute the Villiers stepped out on the patio behind the Illini Union and I saw them for the first time. Hunted, hunter, refugee, patient, prisoner. Even my decision to work for the general was forced—it looked like my only ticket out of prison, my only chance to take charge again. I wasn't comfortable being jerked on somebody else's strings. Back home, I started making my own decisions before I was ten. Mom worked and there were times we didn't see much of each other. I had school and sitters. I did what I wanted and took my lumps when I couldn't talk my way out of them. I made mistakes but I learned fast. By college, I was used to taking charge. I joined StEP, and within months I was doing the talking for our chapter and making myself heard in the national organization. It came naturally. Talking to crowds never fazed me, not even the first time.

That's what I thought, anyway.

"What are you so nervous about?" Caroline asked Friday evening. We were having dinner at the Officers's Club.

"I have to give a speech Monday and I don't know what to say."

"Is *that* all?" I was too tense to read anything into her comment. I had been toying with my food so I tried to catch up. I had put on twenty pounds in two months. That sounds like a lot, but I liked the new me—with all the sharp edges rounded off—and I exercised.

"I can't help with speeches," Caroline said. "English was never my best subject." She was wearing a pale blue dress, very modest (old-fashioned, I thought) in cut. I still wasn't used to the conservative way women dressed. I had yet to see jeans on a girl. Any slacks were rare, and *forget* shorts. Caroline

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had talked me into taking her to the Friday dance at the O-Club despite my protests that I couldn't dance. I never had time for it in my world, and I didn't even know what dances people did in hers.

"Is it OK if we take a walk before the dance?" I asked.

"Sure." Her eyes were a fantastic blue. Honest, they seemed to sparkle.

Outside, we started around the main square of the base's "downtown." We were in no hurry. The circuit took us a half hour.

"This is beautiful country," I said, "trees, mountains all around. Back home, a mountain is any pile of dirt higher than a car."

Caroline laughed. "I like it too. We've been here five years, the longest we've ever stayed in one place. My last year of school, I was terrified that Daddy would be transferred before graduation."

"Where'd you live before?"

"All over. Let's see—a year in the Canal Zone before here, two years at Fort Knox, two in Cuba, three at Fort Sam Houston. That's as far back as I remember." Cuba was as American as Puerto Rico in her world.

"You've traveled more than I have." In one way, that was true. In another —oh, brother! "Until this summer, I lived my whole life in Illinois, most of it within spitting distance of Chicago."

"I went through there on the train once. Do your folks live there?"

"My father died when I was four. I lost my mother this summer." *Lost.*

"I'm sorry." Caroline moved closer to me as we walked on.

"What kind of dreams do you have?" I asked. "What kind of plans?"

"That's easy. I want to get married and live in one house for the rest of my life. I *hate* moving." I guess most guys would have been spooked by a girl saying something like that just after they started going together. But I could see that it was a reasonable goal for an army brat.

"You know, I really don't know anything about dancing. I was always too awkward to learn." I pointed down. "See? Two left feet."

"You don't want to go to the dance, do you?"

There are times when the truth is too hazardous. "I want to be with you. If that means going to a dance and making a fool of myself, I'll do it gladly."

Caroline started laughing raucously, and I didn't think she was going to be able to stop. The few people who were on the square looked at us as though we were doing something quite improper. I could feel myself blushing.

"Daddy talks like that when he doesn't want to make Mother mad," Caroline said when she got the laughter under control. "We don't *have* to dance. We can just sit and listen to the music and have a drink. Maybe later we can sit in the park for a while."

"Are you sure you can trust me alone in the park?" I teased.

"Oh, I hope not." My heart started skipping. For once, it was a good kind of nervousness.

The music had started before we got back to the O-Club and went down to the cellar ballroom. I'm not sure how to describe the music. It wasn't rock and roll, rhythm and blues, or jazz. It sug-

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gested a little of all of them, but there was more—call it structure—than in the music I knew back home. The musicians were soldiers and civilian employees at the Center who played in their spare time. Caroline and I got a table as far from the bandstand and lights as possible. I watched the dancers for a bit, then decided to gamble.

"I'm willing to try it, just to prove how bad I am."

Three minutes. The ordeal couldn't have lasted any longer than that, but it seemed like ages. I stepped on Caroline's feet, tripped over my own, plowed into other dancers. The only thing that made it bearable was holding Caroline, even if it was at a distance. Nobody danced *too* close. It just wasn't done. Not in public.

"You *do* have two left feet," Caroline said as we limped back to our table. Then she said, "It's getting stuffy in here."

I know a hint when I hear it. "Would you like to get some air?"

The park was a twenty acre tract between the main post and the residential area. Part of it was thickly wooded, part was manicured lawn with swings and slides and wooden picnic tables. After dark, the park was quiet but never dangerous. Violent crime wasn't the problem it was in my world, and on the military reservation it was almost nonexistent. A few other couples were there before us. We carefully ignored them, part of the etiquette of such things.

"Here's a nice place," Caroline whispered—a picnic table sheltered on three sides by trees. I sat on the bench and Caroline sat on my lap. We started to neck. She took the lead at first. I was so used to the prim public behavior of everyone that I needed time to catch up.

"You know what they say about army girls," Caroline whispered later.

"That you're the most beautiful girls around?"

"No, that we're the most shameless hussies since Sodom and Gomorrah." She went from whispering in my ear to nibbling on it.

"Are you?"

"We can be, when the right man come comes along." But not in the park. We went to my house. OK, different places, different standards, but I had a hard time thinking of a 19-year-old virgin as shameless.

Despite the late night, I was up at dawn Saturday and drove to the base gymnasium. Roy Jennings and I met there three days a week.

"Ready for your lumps?" Jennings asked. He seemed to enjoy our sessions more than I did, even though they were my idea.

"I'm ready." And, for an hour, I got my lumps. Literally. Jennings was teaching me unarmed combat. I was getting increasingly paranoid, afraid that someone would come along and snatch me again, dump me in an even more backward world. Sure, there was always security around, but I didn't count on that being enough, not when the people I worried about could blink in, grab me, and blink out again in seconds.

"There," Jennings said finally, wiping sweat from his forehead. "I guess that's enough for today."

I just nodded. I was puffing too hard for words.

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"Ready for the pistol range?" Armed combat was also on the curriculum. I expected to beat Jennings on the range long before I could on the mat.

"Ready." Jack Devlin was gone, "transferred to other duties." Nobody would say why, but I guessed it was because he thought the idea of sending people to the Moon was so preposterous.

If only I could get rid of Brit and Kole so easily. Every time I saw them—and it was always both of them, it seemed—I could bank on a nightmare that night. They made me so nervous. I had trouble separating them from the analogs who tried to kill me—the men I helped kill in preventive self-defense.

That afternoon, Black arrived with some of our researchers. I was picnicking with Caroline and her parents. The "public" Caroline was back, but I had anticipated that. She hadn't come home late enough the night before to make her parents suspicious. The general's orderly found me without difficulty. I made my excuses and left. Black was in my office.

"We've got your twenty top people," he said. "Mantoan has their files. They're all at the top of their respective fields. The best in the country."

"Do they know why they're here?" I sat on the corner of my desk since Black had taken my chair.

"No, I just promised that it would be big enough to be worthwhile."

"There's something that bothers me about this, General. Draftees may work out fine in the infantry, but not in a research program like this." Tom Mantoan hadn't convinced me of anything.

Black snorted. "Ask any of them if they're interested in being at the center of the largest concerted research program ever. Mention a fifty *billion* dollar budget for ten years. Then take a wild guess how many of them don't want to be part of it. Hell, they'd fight for the chance."

"Without knowing what it was?"

"Almost without asking." That was another difference between here and there, or maybe just another facet of the same difference.

"Oh, by the way, you can forget about finding anything of Goddard's," Black said. "He died in a rocket experiment, some kind of explosion, in the twenties. His family burned all his papers."

"What about amateur groups, hobbyists? There must be people around who've worked with liquid-fuel rockets. It might save us a year."

"If there is, we'll find them. Why don't you talk to the chemists and physicists we found. Seems they might know if anyone's messing around with that stuff."

I nodded. "I've got a crazy request, General. Can we get lists of everyone who's received an advanced degree in math, physics, chemistry, astronomy, and so forth in the last fifty years? I might recognize names that I don't recall offhand, people who did something important in my world."

Black looked at me like maybe I did belong in a nuthouse. "I'll put some people on it."

I was the youngest person in the auditorium Monday morning and acutely aware of it. Seeing the twenty men who

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had been lured to the Center to head up the research for Project Apollo stirred up butterflies in my stomach again. Gray heads, bald heads—the youngest of them had to be twice my age. And I was supposed to be their boss.

We had a lectern set up down on the floor in front of the stage, and our "recruits" were scattered through the center of the first six rows of seats. These were the men who would be at the core of our project, senior researchers and department heads—all men. There were uniformed guards outside the building to guarantee our privacy and two FSP agents, Brit and Kole, inside. Tom Mantoan opened the session with a few welcoming remarks, the sort of blather any competent administrator can spout in his sleep.

Then it was my turn.

"Save your groans, I'm not the boss' nephew here to sing 'My Old Kentucky Home.' " That got a few smiles. "I'm not as young as I look. It's just a cross I have to bear." My audience started to look more at ease, and I felt a little less uncomfortable.

"I'm Charles Treville. My doctorate is in physics. At present I'm special assistant to Dr. Mantoan, but once we get organized, I'll be director of Project Apollo. Stripped to essentials, we just have to find a way to move a few men and some scientific gear from one place to another, and back."

Mantoan turned on the slide projector and an eight foot image of the Moon appeared on the screen, up on the stage behind me. I shut up and let my audience figure out what I was talking about.

You'd be surprised how much noise twenty excited scientists can make.

* * *

4.

We had a light dusting of snow the morning of December 23, but the snow disappeared quickly. By three o'clock that afternoon, when Caroline and I were married in the base chapel, the streets were dry. It was a long weekend for everyone at Project Apollo. There hadn't been many days off in the past ten weeks. My twenty top men all had help now. Our staff had reached six hundred and it was still growing. We had accomplished a lot, even if we hadn't started building our first rocket. Getting that many people together and organized is an achievement in itself, and we *were* moving forward.

The wedding ceremony was short. The reception was even shorter, just a few minutes for congratulations and such. Then Caroline and I were whisked out to the base airfield. General Black's staff plane was waiting to take Caroline and me to St. Augustine. It wasn't an act of kindness—the plane. Black expected to get work out of me even on my honeymoon. Tuesday, the day after Christmas, I had to go to Canaveral to check on the work there. The Cape had been mostly-bare coastline two months before. We were transforming it into a construction and launch facility for Apollo. Call it superstition.

Our twin-prop plane was luxurious, fit for carrying big brass around at 280 mph. There was seating for six passengers, a galley, and a stateroom that slept two. We had an unscheduled layover in Atlanta while our pilots waited out a fast-moving storm that was tracking up the coast. We took off again at 1:45 in the morning. Caroline and I managed

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a little sleep before we landed at an Air Force auxiliary field just south of St. Augustine. There was a car and driver waiting. The driver was probably FSP. General Black wouldn't leave me without cover away from the Center. The coast road was wet but the rain had stopped. Just as we reached our motel, we saw the start of a spectacular, sunny dawn.

After a short sleep and a light breakfast, Caroline and I made the tourist rounds. The old fort and souvenir shops would be closed Christmas, and I had to make my inspection trip Tuesday. There was no way to know if Caroline and I would have time for sightseeing after that. I wasn't due back until January second, but I didn't expect to get away with that long a honeymoon. *Something* was bound to come up that would start Mantoan, or one of my department heads, yelling for me to get back early.

That evening, we listened to Christmas carols on the radio and shared a little wine. Unfortunately, I had one of my nightmares later on. I guess I screamed or something, because I woke Caroline. She turned on the lamp next to the bed.

"What's wrong, honey?" There was fear in her face and voice. I was shaking. It was the firing squad nightmare, a particularly gruesome variant that had all the Brits and Koles burning like Christmas candles when they shot me. Then they were burning in the Urbana police car.

"Just a nightmare," I said. I pulled Caroline to me and held on as though my life depended on her. Or my sanity. We left the light on. Eventually, I calmed down enough to sleep again.

Christmas morning, Caroline and I exchanged gifts before we got out of bed. When we did get up, we went walking along the beach—for hours, arms around each other, oblivious to everyone else. Typical honeymooners. At first, we both carefully avoided mentioning my nightmare.

"This is a silly time to mention it," Caroline said, "but do you realize that I know almost nothing about your past?"

"I realize," I said after a moment. Black and I had argued about how much I could tell Caroline. "You want to hear something even sillier? My entire personal history before I reached the Center is classified top secret."

Caroline glanced my way, then waited. She didn't even laugh. While we walked along the beach then, I told her everything, even about the nightmares. When I finished, she was quiet for a long time before she spoke.

"I knew there was something mysterious about you. Maybe that was part of the attraction at first. After all"—we stopped and she turned to me—"they don't bring in kids to be project chiefs, or give them field-grade-officer housing. And three-star generals don't drop in for casual chats."

I laughed. "Anything else, Sherlock?"

"All the activity—construction, new people. The excitement even got to the army detachment, talk of stepped-up promotions right down the line."

"What do you think about us putting men on the Moon?" I asked.

"You won't be one of them, will you?"

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"No, they'll all be test pilots."
"Then it's OK with me."

Caroline and I flew to Canaveral. The changes made in ten weeks were startling. Buildings, roads, a permanent airfield, and launching pads were under construction. Metal Quonset huts had been erected and fences strung. A thousand workers were busy. A security battalion was in place. There were also FSP agents around. Like Brit and Kole—my complaints had resulted in their transfer to Florida. Whenever Brit looked at me, I felt uneasy. I could see hatred in his eyes. But he never did anything he shouldn't—except in my dreams.

The site superintendent took us around in a jeep. Then we had lunch in one of the Quonset huts. The dust was thicker than the gravy. After lunch, the super showed us artists' conceptions of what the place would look like when it was finished. I didn't mention that I had helped with the composition of the drawings. Caroline hadn't seen them before.

"Are you sure this is all possible?" she asked while we were flying back to St. Augustine.

"It's been done once. It can be done again."

"How long will it take?"

That was a good question. In July 1979, we launched our first satellite, a sphere the size of a large pumpkin, atop a two-stage solid-fuel rocket. The pumpkin provided data for two weeks before the orbit decayed and it burned up during reentry. It was a smashing success and balanced our frustrations over the liquid-fuel program. It wasn't until November that we had a successful test there, and May 1980 before the first liquid-fuel rocket made it into space. There were other elements to the work too, of course, the design of components and instruments. And, in Kentucky, we had a team building this world's first solid-state computer, transistors and printed circuits, six percent of the size of the best existing computers, with thirty times the capacity and speed.

Charles Junior was three months old when our first manned sub-orbital mission flew in March 1982. A year later, three men rode our Moon capsule around Earth thirty-seven times. The first geostationary communications satellites also went up in 1983. Our twins, Sharon and Sheryl, were born that fall.

The lunar lander took another eighteen months. The first shoot of the complete lunar rocket assemble didn't happen until July 1986. Then we put three survey satellites around the Moon to map the surface in detail so we could choose landing sites. We weren't going to put men around the Moon until we were ready to land them—one of our shortcuts. But we tested everything extensively in Earth orbit. By that time, we did have competition.

"There's a German in orbit," Black thundered as I climbed into his car the morning of February 27, 1987, not quite eight and a half years after the start of Project Apollo. Black had flown in overnight and picked me up at home.

"They have to be years behind us," I said, as we drove toward the section of the Center that Apollo had taken over. We were administratively separate now, directly under Black's control. He was Secretary of Security now. He also

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had his fourth star, but that was the only visible change. Me, I'd put on more weight and my hairline was in full rout. Long days and constant worry had deep-sixed the boyish looks. That and the nightmares. What really hurt was that nobody flinched on hearing my "official" age any longer.

"We're not on the Moon yet," Black said. "The German Empire's quite capable of spending every pfennig they have to beat us. One setback and we could have a real race."

"General, we go for the Moon in five months. The Germans can't possibly catch up that fast." Black had used a phony German threat to get our program started, and he was caught up in his own lie, scared that it might come true.

"The reports I have say that their main rocket is a lot more advanced than our early ones were," he said when we reached my office.

"You know how important Germans were in the space programs in my world."

"If they're that good, maybe we *do* need to worry."

"A year ago, maybe even nine months ago," I conceded. "Not now. What did they put up, a one-man capsule?"

"They aren't saying, but we've only heard one voice."

"Have they made any public announcement?" I asked.

"You know the Germans, not a word until it's over. If then. They won't gamble on bragging about a shot and then have something go wrong."

Not like us, huh? We never mentioned our early probes, even after the fact, and we still squelched any hint that we had permanent satellites up. The manned shots? We announced when one was pending, but never gave an exact time or date, and there was never live coverage. After the astronauts were safely home, we distributed press releases. Big deal. But the general really believed that there was a difference between the way we handled it and the way the Germans did.

"Is there any way to accelerate our schedule?" he asked.

"Accelerate?" It was my turn to shout. "Just pray we don't fall behind the schedule we've got. It's tight. There *is* something we can do to get more mileage from our mission though." I lowered my voice. "Televise the whole thing live—launch, talks by the crew in space, landing and first steps on the Moon. Then, no matter what anyone else does, it'll be our Moon shot people remember. Beam it worldwide. Think of the prestige."

"Think of the embarrassment if something goes wrong."

"Try sympathy. Respect. Our gear is good. We've never had a major malfunction or accident. We win no matter what. In different ways."

"I'll think about it."

"It worked back home. People cheered for us, liked us better, respected us more."

Black got up and started pacing. "That's too big a decision to make without a lot of careful thought. I'll get back to you on it."

That was all I could hope for. The decision *was* big, so big that President Lebrun would have to make it. Halfway through his fourth term, he might think the risk was justified. According to rumor, he ran for his fourth term just to

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be in office when we landed on the Moon.

"By the way," Black said as he started for the door, "the decision to go into production on DynaSoar still has to wait until the Moon landing works. The president's all in favor, you know that, but he can't afford to start us down another expensive road until this one proves out."

"We've got people who could be busier. DynaSoar is mapped, ready to go. We're well into work on the space station, the permanent Moon base, the manned mission to Mars, the super telescope in space. We've got to start moving from planning to development, get these projects moving so we can get into the next generation of ideas. Back in my old world, they should have the space station and telescope operational by now. In eight years, they'll be on Mars. And *their* DynaSoar is probably obsolete, replaced by something even more advanced. We're losing ground again."

The general made a face and left. He was used to that kind of speech from me.

I went through my overnight messages and decided that there was nothing that demanded immediate attention. I had time for my regular session in the gym with Roy Jennings. We were, finally, almost evenly matched on the mat. Our competitions kept us both alert. We had never really become friends, but we had a working respect for each other. It was enough.

5.

"I still think it's too much to expect your mother to watch the kids for two weeks," I told Caroline. Four children, the oldest five and a half, are too much for any one person. Caroline and I had trouble keeping up.

"Mama wouldn't have it any other way." Her mother *was* pretty indignant when I suggested bringing in someone while Caroline and I were in Florida. "Besides, Daddy's taking leave the whole time we're gone."

"You mean the Colonel's going to babysit?" Full colonel now, on the list for promotion to brigadier general.

"That's just what I mean. Quit dawdling. We're going to be late." The years had been kind to Caroline. Her hair was a little darker, more auburn than real red. Her eyes were still wildly blue, full of life. Four babies hadn't hurt her figure, though I wasn't supposed to know how much work she put into making sure they didn't. The kids were already at grandma's. Junior and the twins thought it was great. Ellie was too young to voice an opinion that anyone could understand.

Roy Jennings was waiting with the car. He was going on the trip as part of our security. The terminal at the Center's airport was crowded. Most of our senior staff and their spouses were going to watch the Moon mission—a reward for years of hard work. Of the twenty researchers who started Project Apollo, only Virgil Brown was missing. He had died of a stroke the summer before. Virg came to us as a mathematician but did his most important work programming computers. A bronze plaque with his name and dates would be left on the Moon. General Black was already at the Cape. Putting Americans on the Moon was his obsession. He had gone out on a limb with Apollo. And with me. There

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hasn't been a bigger political gamble since Julius Caesar crossed the Rubicon.

"Doctor Treville?" We were halfway across the terminal. I spotted a young man hurrying my way and waving. "You have a call in the manager's office." Caroline went on with Jennings and our skycap. I went to the office. It *had* to be General Black on the phone.

"There's a tropical depression forming in the Atlantic," he shouted. "Meteorology gives it a 20 percent chance to bollix our launch."

"I can't help the weather, General. If it's too rough, we'll have to postpone." I held the receiver away from my ear. When the general gets excited, he gets loud.

"Dammit, we can't postpone. There's activity in German West Africa. We think the Germans are ready for another big space shot. Shit, it's been clear as hell here for three weeks."

"I'll be there in four hours. I've got to go now."

Our plane was a Wright Jetman, the first commercial jet. While we were in the air, President Lebrun told the world what we were about to do. Barring weather delays, we would launch three men on a round trip to the Moon the following morning. The mission would be televised live, start to finish. I was excited. I wasn't sure Lebrun would take the chance.

Dinner was at the space center. The Apollo Six astronauts were the guests of honor. Alec Conte and Bill Hardesty would land on the Moon. The man left in lunar orbit would be Henri Leclerc.

"They don't seem nervous about tomorrow," Caroline said while we were getting ready for bed after the banquet. An entire motel had been requisitioned for our use. The proprietors were happy to have us. The government paid better than rare off-season tourists.

We cuddled up in bed. Caroline rested her head on my shoulder and whispered, "It's hard to believe that it's finally here. All the work and worry, the late nights. We're actually going to do it."

"And as soon as they get home, I'm disposable."

"No, you're not," Caroline said.

"I promised Black the Moon. When he gets it he can put me out to pasture. I've always been a freak who made him nervous. To tell the truth, I'm ready for the easy life. We can get that permanent home you've always wanted, someplace quiet, with a good school system for the kids."

"Phooey. You'd go stir crazy in a week." I stiffened at *stir crazy*. Those memories were too easily recalled. "Sorry," Caroline said. "Poor choice of words." She shifted around to kiss me, and then lay across my chest.

"Think your folks'll babysit again this winter?" I asked. "We could take a Caribbean cruise. See the islands."

"That would be nice." Her voice was getting heavy. She was about to fall asleep. Not me. As usual, I was nowhere near sleep.

My work load *would* drop off after this mission. Sure, we'd go ahead and put more men on the Moon, eventually a permanent station. We'd build DynaSoar, the space station, all the rest. But the void was waiting to claim me. I'd have delivered on my promise. I was just starting to see how much that promise had meant to me. It kept me sane,

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kept me going through the rough times, helped ease my exile. I couldn't forget that I was in a world that wasn't mine. I needed help, always. The moon and Caroline. And the kids. Now the moon was almost in my pocket, a memory rather than a goal.

I felt Caroline shaking me before I heard the phone ringing. She answered it while I fought my way through the quicksand that separates sleeping and waking for me. "It's General Black," Caroline shouted. She knew how hard it was to wake me. Only nightmares could do it quickly. I sat up, not nearly awake. Caroline put the phone in my hand and pushed it toward my face.

"Yeah, General?" I tried to pump my mind awake by blinking rapidly.

"Red alert. The Germans launched a two-man rocket fifty-two minutes ago."

"A Moon shot?" I asked, suddenly alert.

"How the hell would I know? I've got people here working on it."

"I'll get to mission control as soon as I can."

"Damn right. My driver will pick you up in ten minutes."

Barely time to shower. Caroline had my clothes waiting. We only had time for a quick kiss before the car arrived. Dawn was still an hour off.

"They're up there, four hours ahead of us!" Black shouted when I reached the supervisors' platform above mission control.

"What about the orbit?" I asked.

"Maybe yes, maybe no. That's all I get from anybody."

"How's *our* countdown going?"

"Four hours behind the Germans, that's how it's going!"

"Are they running live coverage? Have they told their own people that they've got men in space?"

Black calmed down long enough to make a phone call. In one minute, he had answers. "No live coverage, no announcement."

"Then it doesn't matter, does it?"

"What do you mean?" Black asked.

"After we have trans-lunar insertion, we announce that the Germans have launched a low-orbit craft—no time of launch, no lies, just nothing complete. Our people will be watching Apollo Six live so they'll assume that the Germans followed us up. If they head toward the Moon—and I still think that's impossible—we continue updating late. Nobody will believe a German claim to be ahead of us then."

Black thought about it. "The president won't buy it, and he's the one who counts." He sounded disappointed.

"Look, there's damn little chance they're aiming for the Moon today. Even if they were stupid enough to try, they can't beat us to the surface. We've got the maps. We know where to land. Unless we've missed German launches or they've broken our telemetry codes, they'll have to find a landing zone when they get there." *If they beat us, it's because your intelligence service failed.* That's what I was telling him. That's how he understood me.

"We haven't missed any German launches. And there's no way they could break our codes." A touch of anger.

"Then we've got nothing to worry about," I said. That didn't keep either of us from worrying, but we got in-

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volved in our countdown, and then the bus arrived. Caroline joined us on the platform. The rest were seated in a visitors' gallery off to the side of the control room.

At T-minus thirty seconds, we had our last scheduled hold on the count. A survey of mission control stations, the crew, and. . . .

"Apollo Six, you are cleared for launch."

The cheering started in mission control as Apollo Six cleared the gantry. Black, Caroline and I went outside to watch the rocket until it disappeared. Back inside, we watched and listened as the first and second stage burns and separations went perfectly. When the third stage shut down and Apollo Six went into orbit, there was more cheering. The Germans were still in Earth orbit, halfway around the world and ten miles lower than Apollo Six.

"We have a green board," the mission supervisor announced after our first orbit. We could go for the Moon on the second orbit or later. Black looked at me. I met his gaze. His decision was no surprise.

"Go on this orbit." The Germans were still in Earth orbit when we started the burn to take Apollo Six toward the Moon.

"We beat them," the General said, his face flushed with excitement—even though the real mission had just begun.

It was an incredible time, beyond description. There were no problems all the way out. The Germans came back to Earth before we reached lunar orbit. Then came a tension that was almost orgasmic in its release. The landing on the Moon was something we couldn't fully test in advance. Alec Conte and Bill Hardesty had to make the final decisions alone, and we weren't 100 percent certain that the surface would support the lander. We thought it would, but . . . I held my breath until the radio gave us the news.

"This is Moon Base Alpha. We have arrived."

There was total bedlam in mission control.

Later, Alec was the first man to walk on this Moon. A camera on the lander showed him descending the ladder and jumping off in slow motion. "Our first step into heaven," Alec said, or perhaps it was, "Our first step into the heavens." The transmission was garbled. He knelt and crossed himself. Then Bill came down with a U.S. flag and planted it thirty meters from the lander: another cheer in mission control.

The entire mission was electrifying. Day and night were irrelevant for us at the Cape and for tens of millions of people who were glued to their TVs. Meals, sleep, even sex and work took a back seat to our conquest of the Moon. For the first time in years, I had no trouble sleeping—mainly because I didn't lie down until I was out on my feet. I was even too exhausted to dream.

Day eight was the finale. The capsule splashed down in the Atlantic at 10:37 A.M., six hundred miles from Canaveral, eight hundred yards from the aircraft carrier Marquis Lafayette, the prime recovery vessel. General Black had to interrupt his part in the celebrating to take a phone call.

"That was the White House," he said when he returned. "The crew of Apollo

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Six will be honored there tomorrow. The president wants us, too—you, me, your department heads, and spouses. I've got a list, or I will have as soon as I write it down."

"We're going to meet the president?" Caroline asked after Black left.

"From what I hear, July's not the best time to visit Washington."

Caroline punched my arm. "You stinker. This is no time for jokes. We're going to meet the president and I don't have anything to wear."

"I don't think it'll be formal."

"I've got to have something new. You should get a new suit, too."

"There's no time."

"We'll have to make time. Talk to the general." When I hesitated, she said, "Or do you want *me* to talk to him?"

I couldn't resist. "Go ahead, dear. But remember, he's been married since before you were born."

I should have known better. . . .

Our plane left Canaveral ninety minutes after the astronauts were pulled from the Atlantic. The navy would fly them to Washington. We stopped in Atlanta long enough for a quick shopping spree. The General *had* been married a long time, and even though his wife didn't travel with him, he didn't try to argue with Caroline and the others.

6.

We got to Washington late that night and settled into the Watergate. The next morning, Caroline and I ran a little late. The bus with most of our people had already left for the White House before we got down to our limousine. General Black's aide was waiting for us when the car pulled up at the White House. He took us inside.

"You didn't leave me much time to brief you on the ceremony," Black said. He sounded annoyed, but his briefing didn't take sixty seconds. It could hardly have been briefer.

When we went back outside, the rest of our party was seated in the Rose Garden facing a lectern with the presidential seal and a bouquet of microphones. There were reporters and cameras behind our people. The government network was going to televise the ceremony live. The commercial networks would cover it on their regular news programs. The Blacks—the general's wife had come along for *this*, Caroline and I were seated behind the lectern to one side, the astronauts and their wives on the other.

When the president and first lady came out, we all stood until the president told us to sit. Alexandre Lebrun was seventy-one, reed-thin but healthy and vigorous. He did a twenty-minute paean to the space program, our "conquest" of the Moon, the democratic way we televised it live, and so forth. He promised continued support of the space program and bigger successes—including DynaSoar, which was going into "immediate" production. Finally, he introduced each astronaut and awarded the Presidential Cross for Valor, the country's highest non-combat decoration. I was so startled when he gave me the same award that I didn't hear the citation or notice that General Black got one, too. I sat there like a dummy, staring at the silver cross on a bronze disk hanging from my neck. Caroline squeezed

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my arm. I looked at her. She grinned and winked.

After the president and his wife left, reporters asked questions in an orderly, respectful manner. An aide took Caroline and me back inside the White House. President and Mrs. Lebrun were waiting. We shook hands all around and I introduced Caroline. The first lady took her off and the president led me to the Oval Office.

"I can't tell you how proud we are of the work you and your people have done," the president said when we were seated. "You've given our country the greatest boost we've had in ages, at home and around the world. By God, man! You've given us the *future*. This could be bigger than the industrial revolution or the automobile."

I'm as susceptible to flattery as anyone. I nodded my thanks and tried to find words. Lebrun chuckled. He was as excited as any of us had been at the Cape during the mission. He didn't seem anywhere near seventy-one years old right then.

"I want you as my new Science Advisor," he said. "I *do* know about your unique qualifications and past. I've known from the start. And while I've only got a year and a half left in office—no, there won't be a fifth term—Bob Madran assures me that he will be delighted to have you stay on in his administration. Provided he wins the election, of course."

As if there was any doubt. Bob Madran was the two-term vice president. Running on the coattails of Lebrun and the Moon, Madran was a shoo-in, even if the election was perfectly honest. And, while I had my doubts, I'd never seen or heard anything that really shouted, "*J'accuse!*" Lebrun *was* overwhelmingly popular, even after fourteen years in office.

"It sounds good, Mr. President. Can I think it over? I have to clear it with my wife."

I *was* looking for something new. Caroline was all in favor, right from the start. And when I went to see General Black for advice, he knew about the president's offer.

"Don't worry about it making you my boss," he said (even though the job wouldn't, strictly speaking, have anything to do with him). "I've put in for retirement. It's time to get out when everything's rosy. I've made my mark. They'll let me leave with a fifth star, only the second American to ever make Field Marshal."

"Congratulations. I *would* like some advice before you shuck the job, though. I'm looking for something new for the R&D Center"—that was now an adjunct of Project Apollo rather than the other way around—"something as big as the Moon. And . . ." I hesitated. "Well, you remember me talking about that old gray sedan?" He nodded.

"We've got the best computers in this world and some of the best minds. How long do you think it'll take to find the secret to *that* kind of travel? How long before we can travel to any world in any time?"

For a moment, his eyes caught fire. I could almost hear him saying, "To hell with retirement." But then the fire died.

"Not in my lifetime," he said sadly. "Maybe not in yours."

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"I know." I did. That technology had to be generations down the road. "But here's something to tickle your mind with." I paused and he waited.

"This many worlds framework," I started, and then I stopped again. I shook my head. "This is going to sound crazy," I warned.

"I'm used to that." Drily.

"The idea seems to be that for every event a new parallel opens up for every possible outcome." We had explored some of the theoretical possibilities over the years. "Whenever a person dies, there's a new world in which he didn't. When he dies there, there's still another world in which he's still kicking. You follow?"

"What are you getting at?"

"Just this. It seems that an essential corollary of the thesis *must* be personal immortality. For every person who ever died—*ever*—there has to be a world, or an infinite series of worlds, in which he's still alive."

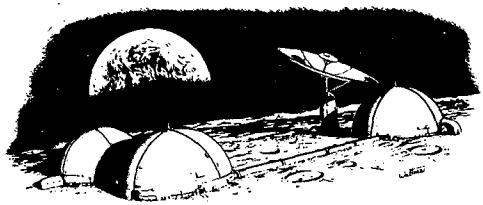
"That's crazy!" His face screwed up like he was about to vomit. For minutes we were both silent. "That's crazy," he said again.

"Maybe," I agreed, "but if it is, then the whole notion is crazy, and I'm proof enough that the whole notion isn't crazy."

He didn't say anything more. He wouldn't even look at me. Finally, I turned and left. All those years I had dreaded the return of that old gray sedan or people out to kill me. Now, that old car might be the only chance I could ever have to find out if I was right.

If it ever comes back. ■

EDITOR'S NOTE: This is a sequel to "The Worlds I Used to Know," which appeared in our January 1988 issue.



●If you mean to keep as well as possible, the less you think about your health, the better.

Oliver Wendell Holmes, Sr.

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The Alternate View

WOMEN DRIVERS

G. Harry Stine

(I can hear the squeals of delight already: "Boy, he's put his male chauvinistic foot in it this time!" That's what you think!)

While tooling down a seven-lane boulevard, I was passed by a small, red Turbo-Z car going so fast I almost got out to see what was wrong with my engine. The Turbo-Z was driven by a little young lady who was handling it with all the couth and aplomb of an Indy driver. Furthermore, she was handling it rather well, dodging in and out of lanes of traffic with the same sort of apparent swiftness and assurance recently revealed by the television cameras installed in the cockpits of the race cars during the recent brickyard run.

I have noticed that I am seeing more and more of this phenomenon.

Some male chauvinistic drivers would swear and mutter, "Bah! Women drivers!"

But since my wife maintains that I am a male chauvinist teddy bear, it brought to mind another set of facts from my encyclopedic memory which I tap every two months to take this alternate view of things.

In American culture for the last 75 years of so, a folk legend has been perpetrated concerning the ability of women to operate machinery. Since Americans have had a long love affair with their automobiles, this folk legend has appeared most visibly as the disgusted male snort, "Bah! Women drivers!"

But, in company with many other of our folk legends, does it have any real validity?

I doubt it.

Women seemed to do very well, indeed, running the war production machinery from World War I onwards, and Rosie the Riveter was a folk heroine of World War II.

Women are preferred for assembly line work in electronics where they operate some of the most sophisticated production machinery in the world.

I was unable to obtain any statistical data about women drivers versus men drivers from various insurance companies. I don't really know why this information is kept so close to the chest. Perhaps if the men really knew. . . . I do know that rates for women drivers are lower.

But outstanding data exists for women airplane pilots.

Furthermore, the pilot data base may be more meaningful because everyone who gets any sort of a pilot's license — private, commercial, or airline transport pilot—must meet certain basic minimum federal standards of performance and knowledge. Everyone passes a flight test. Everyone must pass the written test. Everyone must have a given minimum number of hours of ground and flight instruction, plus flight experience. All pilots, regardless of rating and experience, must pass a physical exam and a flight review at regular intervals, depending upon the sort of pilot's cer-

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tificate held. In short, the starting point of the data base is very constant across the universe of pilots. (This doesn't mean that stupid pilots of either sex don't exist, but that the system tends to eliminate them reasonably early in the game.)

The latest data shows that 43,082 women hold pilots certificates of all classes out of a total U.S.A. pilot universe of 709,118.

How good are the women pilots versus the male pilots?

Men, fasten your seat belts.

The data shows that women are safer pilots than men.

This can be said in spite of the fact that less than two weeks before I wrote this, a young female pilot crashed a Beech Bonanza straight down into a backyard, in downtown Phoenix, killing herself and three other people who happened to be on the impact point having a family barbeque. We still don't know what happened because she was a good pilot with a lot to live for. . . .

A pilot named Gayle Vail has competed an extremely thorough study of male versus female accident statistics for general aviation. She also holds bachelor degrees in psychology and sociology. She's topping those with a master's degree from the University of Minnesota in 1988 with a thesis entitled "Educational Psychology of Aviation Safety." This work includes an analysis of pilot-error accidents for males versus females during the period from 1972 through 1981. She summarized the results in the June 1987 issue of *Ms.* magazine, and her entire thesis was published in a 1986 special aviation edition of *Applied Ergonomics*. Her analysis for the period from 1982 through 1986 should be available by the time this sees print.

Vail used *all* of the data from the National Transportation Safety Board (NTSB) which investigates *every* aviation accident and issues a report assigning probable cause. There is no sampling error in her statistics because she used the body of records *in its entirety*. Her count included 37,862 male accidents and 967 female accidents.

Now this set of raw numbers means little because there are fewer women pilots than men, and women pilots may fly fewer hours than men. So Vail uses the accident rate per 100,000 hours of flying for the given population.

Her conclusions: "Males had a higher rate of accidents than females, and a higher portion of male accidents resulted in fatalities or serious injuries than for females."

Furthermore, taking into account such variables as type of pilot's certificate, age, total flight time, flight time in a given aircraft type, phase of operation, category of flying, degree of injury, specific cause factors, and miscellaneous conditions, the data indicated the same difference in all variables.

Males have an overall higher rate of accidents in all age groups.

Pilots with limited experience—low-time student pilots—can be expected to have the highest accident rate. In this category, Vail's data shows that the male accident rate was 60% greater than that for females.

Accidents involving less than 100 hours experience in a given type of air-

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plane show that the accident rate of males to females averages approximately five to three. As flying experience in a given type increases, the male-to-female accident rate goes from 3:1 to more than 11:1.

The fatality rate for males is twice that for females.

Male pilots do serious injury to themselves, about 9% more frequently than females.

Female pilots walk away from an accident without injury about two-thirds of the time, while male pilots do so less than three-fifths of the time.

Men had almost three times as many accidents involving errors in judgment and had more judgment-error accidents than women had accidents in total.

Ms. magazine says that the reasons behind all this suggest that our culture expects men to be reckless and women to be prudent. This hypothesis will certainly cause controversy. Perhaps, historically, men have had to take greater risks while women are conditioned by society to seek greater security.

Vail doesn't go quite that far. She says that the data indicates men commit themselves more than women.

In my own experience, I've known many women pilots all the way from Jacqueline Cochran Odlum down to Cessna drivers. They've all been excellent pilots, and I would fly with them at any time in any conditions. My own experience echoes that of the military services where some women have managed to make the grade to drive such hot new military machines as the F-16 "Electric Jet" and F-18 "Hornet." The gals who have managed to cut it are considered "one of the boys," complete with very chauvinistic nick-names or call signs.

(Although federal law prohibits these outstanding female pilots from being assigned to duties where they would be involved in combat—something these Sierra Hotel gals are very upset about, because it only allows them to fly the low and slow unarmed transports where they can be shot at and not be able to defend themselves. Perhaps our congresscritters aren't male chauvinists after all. In fighter combat, a pilot must not only be cautious but must also be willing to take chances, let it all hang out, and push it to the edge of the envelope. Would a female fighter pilot be willing to make the necessary committment in a fur ball? Maybe. Maybe not. But what are we willing to pay in order to find out? In combat, you want to reduce your imponderables and unknowns.)

Be that as it may, Vail's work is important because it tells me that long-term changes are indeed under way in our society, and these changes are proceeding as expected. I anticipated some of them many years ago in a Lee Correy short story herein entitled "The Remodeling of Eve." The key piece of trend data upon which the story was based is still a key piece of trend data, but now we are beginning to see some of the consequences. The data: Except for the state of Alaska, there are more women than men in the United States, and the ratio has continued to increase. It is therefore no real surprise to see a growing number of women doing what were formerly exclusively male things. And it isn't over yet. How can it be any different when women outnumber men?

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Thus, I anticipate a growing number of sweet young things driving hot turbo-charged sports cars, and they will continue to ace me out on the freeways. Having studied Vail's data, I am a bit more confident that these sweet young Wilma Mittys fantasizing about winning the Indy-500 on the interstate aren't unduly taking risks and probably won't end up as a messy spot on a bridge abutment. They may be driving more safely than I am! ■

ON GAMING

(Continued from page 91)

The adventure uses something called PlotWords, special words that can trigger events, characters, or information. You start the adventure with three randomly-assigned words, and others can be picked up as you play. Friendly characters can be acquired, including Gundermen pikemen and Bossonian archers.

One neat device keeps combat surprising. At certain paragraph points the player rolls a die, and counts down a series of boxes. The one counted to is crossed out, and that number is checked for probable opponents. At subsequent encounters at that paragraph number, previously checked boxes are skipped, resulting in new combat encounters.

I did have a few cavils about the adventure. At some points you make a decision . . . which turns out not to have been a decision at all. You're directed back to the option you didn't select. That's a technique used in countless game novels, but it has no place in this rich, atmospheric adventure. Also, I came to a point where a character told my character something he already knew. Not that important, but it does interrupt the flow of the adventure. Also, some of the paragraphs have such a lengthy list of "If" options that they become extremely unwieldly.

But these are minor items. I enjoyed *Beyond Thunder River* more than the two dozen computer rp quests that I've seen this year.

Steve Jackson has also just released: *Zombietown U.S.A.*, an adventure that mixes horror and auto-duelling, a pastime created by SJ Games' Car Wars. . . . *The Old Stone Fort*, a horror adventure set in 1920s Tennessee . . . *Harwood*, a grand fantasy adventure . . . and *The AADA* (The American Auto-Duelling Association) *Road Atlas and Survival Guide to the Midwest*. You'll be happy to know that the auto-duelling climate in Michigan is described as "Almost Too Favorable."

Also, in the coming year we can look forward to licensed adventures for GURPS featuring Andre Norton's Witch World and George R.R. Martin's shared world series, Wild Cards. ■

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DIOGENES'S LANTERN

Rob Chilson & William F. Wu

Certain very simple-sounding innovations could drastically change some of our most basic social processes. But not completely . . .

Bob Walters

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Dan Brady sat leaning back in the old office chair, his legs resting on the corner of his scarred wooden desk and the heels of his black shoes on the white window sill. The marks they left today matched the marks they had left at lunchtime over the past seven months, since the building had been painted last. He gazed out at the rolling prairie in the distance, covered by wheat just turning from green to its distinctive gold. He took another bite out of his sandwich.

The visiphone on his desk by the computer screen buzzed. Without sitting up, Dan leaned over just enough to punch it on, making his chair squeak.

"Yeah?" After a moment he added, "KBI."

"Mr. Brady, someone is here to see you." Jane, the receptionist, was pretty and eager and inexperienced. Her hair was straight, brown, and high-schoolish, though she was older than that.

"Call me 'Dan,' remember?" He sighed. Jane was younger than his youngest daughter, wherever she was. Junction City or someplace like that. "What does he want?"

"He won't say."

"Oh, yeah?" Dan took another bite of his sandwich. Other guys spent twenty-three years in the KBI investigating corporate crime in Wichita or Johnson County, or traced drug traffic coming up from the Gulf, investigations that made a difference. Whereas he, on an exciting day, got crazed kids shooting up gas stations as they crossed from one county to another down the highway, or maybe a stolen car, assignments like that. Everybody wanted the crooks but nobody remembered him a year later, and catching them never seemed to change anything. Even most of his murders, as terrible as they were, never were very interesting.

On a good day, he got to finish his lunch in peace. "Tell him if he won't say what he wants, he can wait till my lunch hour is over. Better yet, he can wait till Ron comes back from lunch with his exotic dancer."

Jane stifled a giggle and turned to speak to their visitor. Dan heard only a muffled rumble as a man answered; he was out of the range of the phone's small mike. Jane's eyes were wide when she looked back at Dan.

"He wants to confess to the Henderson murder?" She made it a question, wrinkling her nose. "When was that one?"

Dan kicked away from his desk, rolling on the wheels of his chair, and spat his mouthful of sandwich into his wastebasket. He got to his feet in one quick motion, dropping his sandwich onto the wrapping paper on his desk, and patting the pistol on the back of his belt under his suit coat, with the other hand. His phone remained on as he swung around the door jamb.

Dan had his hand on his piece as he strode into the little lobby, his eyes darting nervously about in case the killer was faking and wanted more action than just an arrest. Nobody else was in the building now during lunch hour. Then he stopped abruptly, brought up by the frail, elderly gentleman in a black suit standing before Jane's desk with both his hands on the handle of a straight black cane.

"Him?" Dan demanded, not taking his eyes off the stranger.

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"That's what he said," said Jane, looking back and forth between them.

"You may relax, Officer," said the visitor placidly. "I am unarmed."

"Special Agent," Dan said automatically. "All right. All right." Dan edged forward cautiously, too experienced to let down his guard just yet. "Let that cane fall to the floor."

"I require it to stand. If I let it drop, I will have to go with it." He smiled pleasantly.

"Jane, back away. You, lean forward on her desk with both hands. Just let the cane fall."

Jane, suddenly frightened by Dan's stern tone, hopped out of her chair and skipped away across the cheap flooring toward the coffee machine in the far corner.

The cane clattered to the floor as the gentleman released it and bent carefully, with the caution of age, onto the desk. Both his hands were in neat white gloves. He did not move or speak as Dan quickly cuffed and frisked him.

Dan finally let out a breath and drew the stranger away from Jane's desk. His upper arm was skinny; Dan's hand went all the way around it.

"All right," said Dan. "Jane, call Ron back here right away. I'll talk to our friend in my office." He started down the hall, then added, "Bring this cane down after you get a hold of Ron."

Jane nodded quickly and hurried back to her chair.

The man was definitely frail. He moved with slow, unsteady steps but walked upright without complaining. Dan eased him into one of the two chairs on the other side of his desk, reciting the man's rights.

"I have no interest in remaining silent," said his prisoner. "The matter of my attorney can wait. I have come to confess."

"So I understand." Dan sat down in his chair, swept the remains of his lunch into the wastebasket, and opened the top side drawer of his desk. When he had switched on the recorder, he shut the drawer again.

"This conversation is being recorded," said Dan. He called up the computer file on the Henderson case. "Now, then. What's your name?"

"I understand my words are being recorded, Agent Brady. I am Nathaniel Chun." He recited his social security number.

An experienced one. "Address?"

"None."

Dan studied him for a moment. Chun had a full head of snow-white hair, neatly brushed back but shaggy around the edges. He wore an elegant black suit, white shirt, and a modest blue bow tie, but the jacket was threadbare at the edges and one of the buttons did not match the others. Nor had any of his clothes been pressed recently.

"Where are you from, Mr. Chun?"

"Lately? The open road."

"Originally, then."

"Chicago."

"I mean, where were you born?"

"Chicago."

"No, I mean, what's your nationality?"

"U.S."

"No, I . . . never mind." Dan glanced over the file on Henderson.

Two years earlier, a twenty-eight-year-old man named Joseph Randall Henderson had been found dead, float-

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ing in a small farm pond in the area. He had been a known drug dealer in Kansas City and had done hard time for manslaughter. He had been clubbed over the head and then thrown into the water, where he had drowned while unconscious.

Dan had not been on the case, but he remembered it vaguely. No suspects had been found and, frankly, no one particularly cared. Joe Henderson had never earned anyone's affection.

This little branch office had just opened then. Ron and Dan had been assigned to a drug ring in the area, one Henderson had not been associated with. The agents assigned to the Henderson case had been transferred when the staff here had been cut to two. This branch had been pretty quiet, in fact. Dan had been expecting it to be closed down any time, but here they still sat.

"Tell me what happened." Dan put that file away and called up Chun's file, using his social security number. There was a delay; the computer hummed.

"Of course." Chun cleared his throat. He was sitting erect in the chair, his hands still cuffed before him. "At one time, through financial desperation, I made the mistake of considering illegal drugs for income. Guilt stopped me before I got started and I told Mr. Henderson that I had changed my mind."

"He was your supplier?"

"He was going to be. When I met with him for the buy, however, I told him that I had experienced a change of heart."

"Go on."

"He called me a number of unpleasant names and then assaulted me. I was lucky enough to hit him with my cane and he fell into the water. I ran away."

"That could make it a justifiable homicide, maybe manslaughter."

"Perhaps I could have simply escaped." Chun lowered his eyes.

Dan glanced at him in surprise, but said nothing. Then he frowned: the dossier on Chun had come up. It was considerable. He was a con artist of many talents, ranging from sophisticated computer theft to simple pick-pocketing to manipulating dice. In fact, most of his arrests involved sleight-of-hand. His first arrest, however, had been for selling a non-existent piece of real estate. It had taken place when he was seventeen in the Chinatown of Chicago. Dan glanced at the box with vital stats and saw that Chun had been born there.

Dan grinned reluctantly. "I see you once tried to beat a crap-shooting rap with the argument that since you were cheating successfully, you really weren't gambling at all."

"It was a sure thing." Chun spread his hands innocently.

"Apparently," Dan said slowly, "you have made and spent, or lost, several fortunes." He watched for Chun's reaction.

"Apparently I have." Chun smiled wryly. "At least, they are no longer with me."

"Where did you sleep last night?"

"In the back of a pickup truck."

"Whose?"

"I was hitchhiking. Some young farm fellow."

Dan looked at the dossier again. Chun had served only a few short sentences in his life, always for misdemeanors, sometimes by plea-bargaining or by

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making deals that involved returning stolen property that could otherwise not have been found. He had never been suspected of any violent crime, not even of threatening or hinting at violence.

Dan rang Jane.

"Yes, sir?"

"Has Ron called in?"

"He's on his way."

"Bring that cane in, will you?"

"Yes, sir."

"Nathaniel Chun," said Dan, reading from the dossier aloud. "Nat Chun, Nat Chan, Nat Chang. Nat Li, Nat Lee, Nat Leong. I'm convinced that your first name is Nathaniel. Which last name is really yours?"

"A man confessing to a serious crime has no need for an alias."

"Hm."

The door opened and Jane came in with the cane. Dan took it from her and set it on his desk. She ducked out again with a quick glance at Chun.

"You hit him with this?" Dan nodded at the cane.

"Yes. At first, that is," he added quickly. "I grabbed a rock afterward. At my age, I could hardly afford to allow him to get up angry."

"Tell me more about the night it happened. What did he say? How did he look?"

"He was nervous, of course, and rather condenscending. He made several derogatory comments about my age."

"Describe him."

"Ah." Chun took a deep breath and rolled his eyes toward the ceiling. "A few inches taller than I, which would make him perhaps six feet. Heavy-set, but I'm no judge of weight, so I won't guess. This was a cool, humid summer night—"

"When?" Dan asked sharply.

"Oh. July, late July."

"What was the date?"

"I don't remember. It was a Monday night, though."

"All right, go on."

"We met after dark, quite late, but he wore cowboy boots, as I recall, and he had this rather dull orange jacket. I remember the jacket from dragging him over to the pond."

Dan looked directly into his eyes. Chun looked back, raising his eyebrows as if in question.

"So he didn't just fall into the pond," Dan said sharply. "You dragged him there."

Chun bowed his head in contrition. "Indeed I did. I feared for my life should he revive."

"Why are you confessing to this crime?" Dan asked skeptically.

"What? I mean, I don't understand."

"I think you do. Everything you've said was made available to the press." Dan did not add that the police had not withheld any information. If they had, he would have been able to trip up this phony. "Nothing in your record indicates a killing like this. Why are you confessing to something you didn't do?"

"Well." Chun lowered his eyes to the floor. "As I said, I was desperate for money and made a mistake. Then I found myself fighting for my own life. I ran because a man with my record never likes his chances in court."

"That part I understand. Confessing now, when no one is looking for you anymore, is what I don't understand."

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Chun smiled weakly and shrugged.

Dan studied him for a moment and called Jane again. He really did not believe the man had clubbed to death an experienced drug dealer half his age and twice his weight. On the other hand, he had to make sure before releasing a possible killer, especially with a long, if nonviolent, record.

"Yes, sir?"

"Tell the county that we're bringing a prisoner over, at least for the night. And he'll be needing a public defender."

"I will represent myself in the legal arena," said Chun.

"I heard him, Agent Brady," said Jane.

Dan sighed and looked out the window at the peacefully swaying wheat fields.

When Ron returned, Dan and Ron flew their prisoner to the nearest county lockup in Dan's aircar and saw that he was processed properly. Then they radioed off duty to Jane and sat down in a local bar.

Dan summarized his thoughts quickly. "It's a pretty old case," he finished. "Not much evidence, no witnesses.It never had any political or media pressure, either. Chun could have done it but so could anyone else. What gets me is, why confess?" He twirled the ice in his glass and watched the light play off it in the dimness of the bar.

"I think he wants a free ride." Ron was thirty-one, with the energy and eagerness and optimism Dan recalled but no longer felt. He still had a full head of wavy hair, too.

"In jail, you mean." Dan nodded thoughtfully. "That's my best guess, too. He forfeited his social security with some of these convictions."

"Sure. If he gets even as much as five years, that will carry him past his life expectancy. He doesn't have to apply for parole. He won't be considered a danger to others or likely to escape, so he'll get a comfortable minimum security slot." Ron shrugged and threw the rest of his drink down his throat. Then he held up the empty glass for the bartender to see.

"He's a sly character," said Dan. "I bet he could have told me exactly what day the killing occurred and exactly what time, probably exactly what Henderson was wearing. If he read up on the case,maybe viewed library news tapes, he knows all that, but he was too sharp to give me a lot of details. He was just vague enough to sound genuine."

"Then how'd you spot him?"

"The killing doesn't fit any of his patterns." Dan shook his head. "We can keep him until we dig through the file again, I suppose. I just can't quite see letting him go, though, either."

"In case he did do it." Ron nodded.

"Yeah. His story isn't *that* bad. I guess you and I both know anyone can kill under the right circumstances. I don't know; maybe he is guilty."

"The decision last month might help."

"Decision?" Dan looked up.

"The court has OK'd the mnemograph for a trial period, remember?"

"Oh, yeah. That lie-detector thing." Dan set his glass down with a thunk. "You think it'll make a difference?"

"*Dan*, I told you all about it!" Ron stared at him. "Come on, it was only a month ago."

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"Yeah, I know, I know." Dan waved a hand in apology. "Look, I was studying the sunflowers outside the window, all right? The ones growing down by the shoulder of the old highway."

"You've got to snap out of this, Dan."

"Look, just remind me about this Captain Nemo thing; I'll get it."

"That's not what I mean. It's more than that. Sometimes I think you've spent the last four years getting fossilized or something. Where's the old fire?"

Dan forced a humorless laugh. "I'm tired, Ronny. I've spent twenty years chasing the same crimes, watching the same guys get off easy, watching new guys come along and do the same things all over again. It doesn't stop. It gets worse, not better."

"You knew all that when I met you. But you hadn't given up. Sometimes I think that's what you're doing now."

"Maybe so. I'm tired."

"Not that tired. Look at yourself. You're still trim, still sharp, still have your reflexes. Jane told me how you handled Chun when you came into the lobby."

"I'm divorced, never meet any women; my kids are grown and I don't even see them much anymore. I'm doing the same work I was doing when you were learning to read; it's a treadmill. I'm stuck out in this assignment in the middle of nowhere—" He grinned. "—with you."

"Touché." Ron laughed. "But you know the aircar is what changed all the locations. We can fly home so fast that these branch offices don't have to be clumped anymore. They've been scattered all over the state according to population density."

"So why don't they put us in a nice place and have us fly out here when there's a crime to solve?" Dan rubbed his eyes and then waved for another drink himself. "Forget it. Is Captain Nemo really a reliable lie-detector?"

"According to all the tests. It measures energy inside the brain, following memory pathways, and so the developers call it a mnemograph. It picks up different signals, based on whether the brain is acting creatively to lie or is working strictly on memory. It doesn't tell us the absolute truth, but at least it tells us when the subject is lying. The research is an extension of old work with brain waves."

"So what's the big deal?" Dan was starting to feel the effect of his drinks and, right now, he didn't mind that at all. "The old lie detectors were outlawed years ago."

"Because they were unreliable. This one isn't, so they say."

"So they say." Dan laughed shortly as the bartender brought his new drink. "If it doesn't work, they'll outlaw it to protect the innocent. If it does work, they'll outlaw it to protect the guilty. Nobody cares."

"Sure we do." Ron watched him intently.

"Speak for yourself."

"One step at a time, then. Chun's case is perfect for the mnemograph. Let's use it."

Dan roused himself a moment, his professional interest overcoming the liquor. "If he's a phony, he won't agree."

"We'll tell him that if he doesn't agree, we'll just release him. If he is a

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phony, maybe he'll just give up then. If he doesn't, we'll go through with it."

"OK, I guess." Dan shrugged. "You set it up."

"Done."

The next morning, Dan sat in the rear section of his aircar, modified for official duty. He was cuffed to Chun, whose hair was still brushed, though not so neatly, and whose suit was a good deal more wrinkled. In front of them, on the other side of the security screen, Ron sat at the controls as the aircar lifted gently into the air, heading for KBI headquarters in Topeka.

"I told your partner," said Chun. "I have agreed to this test under protest. Frankly, I consider it—"

"A violation of your civil rights?" Dan interrupted wearily.

"A waste of a perfectly good morning." Chun looked out the window with interest. "I do enjoy the view, however. Rarely get to ride in one of these newfangled things."

"If you don't like it, we can still turn you loose," said Dan. "Me, I happen to like flying. We can have lunch in Topeka for a change."

"Quite so." Chun smiled. "Yourselves, of course, not I. A prisoner expects poor cafeteria food served up by trustees, no more. Still, I am glad to be of service in some capacity."

Dan ignored his comment, looking out his own window at the shrinking fields below.

"Kind of you," called Ron, over his shoulder.

"So tell me more about this procedure," said Chun. "As the youngsters say, will it hurt?"

"No," said Ron.

"That's what they all say," said Chun cheerfully. "I will let you gentlemen know."

Dan smiled faintly. The old guy was taking this well if he was a phony. Maybe he had killed Henderson after all. Privately, as far as Dan was concerned, it was a service to the state if he had. If Henderson had been arrested and convicted of something, he would probably be back out now, doing the same thing all over again.

"When I scheduled our appointment," said Ron, "I gave the mnemologist all of our questions in advance. She will be prepared, so it won't even take very long."

"A boon to us all," said Chun.

"You know," said Ron. "This could be the test case in the state of Kansas, depending on the results and what happens in court. I think it will be the first mnemograph test in a real case here."

"I am honored again," said Chun. "Though I am surprised, frankly, that two respected law enforcement officers don't want to accept the confession of a killer."

"An alleged killer," Dan reminded him. "The idea is to catch the guilty, not just the volunteer."

"Neatly put," said Chun. "Not all of your law enforcement colleagues around our nation are so particular, however."

"Touché." Ron laughed. "Dan just hopes the gadget works."

Dan glared at him, not liking their prisoner to know too much about his attitude. Then he relaxed, remembering that Chun was probably innocent anyway.

"That's true," he said reluctantly.

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"This Nemo thing is going to cause a lot of trouble if it works. Not to mention that some judge will throw it out of court sooner or later, anyway, if it proves out." His voice turned bitter. "Knowing the truth may be a violation of a liar's civil rights."

"Spoken like a true policeman," said Chun. "But I agree. At my advanced age, this is one terrible time to rob me of my familiar tools—the Fifth Amendment, the plea bargain, the shady defense lawyer."

Dan looked at him in surprise as Ron started laughing.

"After all, gentlemen, isn't that the essence of everyone's objection to this mnemograph: it might actually determine the truth."

"You're right," Dan said, warming to the conversation. "Without it, you could use all the tricks of the past to stay out of trouble. Unless, of course, you go around confessing all the time."

"That is the least of my faults, I assure you."

Ron laughed again.

"I guess I'm a dinosaur," said Dan. "One of the last old lizards. I like the DNA identification process, orbital eradication of illegal drugs, voluntary behavior modification, and all the other legal niceties I was trained with as a young cop. Give me this one fundamental change in procedure, though, and I feel like going out to pasture."

"At your age?" Chun shook his head. "You must have the advantage of me by a full generation. Yet I'm still full of life."

"What do you say, Ron?" Dan called. "Shall I give him my 'I'm tired' speech, the one I gave you yesterday?"

"And the day before that and the day before that," said Ron. "No, thanks."

"You're intelligent and honest," said Chun. "You must be. That's why this job is weighing on you. Sure, I've seen it before. A guy like me gets off easy after all your hard work to put me away."

Dan looked at him sourly.

"Here is your chance to get even," said Chun. "You'll get credit for my confession without doing any work to speak of."

"Especially if we were to dispense with this mnemograph test," Ron observed.

"True." Chun composed himself and shrugged.

Dan watched him a moment, then stifled a laugh. This guy was good. He had never suggested skipping the test himself; he had simply drawn the conversation to the point where one of them had brought it up. Still, that had backfired. Now Dan wanted to go through with the test just to prove that they could not be manipulated.

"I *am* curious about this mnemograph," Dan said thoughtfully. "When I think of all the witnesses over the centuries who got away with perjury, I see this could mean something."

"Or all the witnesses who were tortured for the truth even when they were already telling it," said Chun. His voice was quieter this time.

"Innocent people convicted, even executed," said Ron airily.

Chun smiled politely and looked out his window at the fluffy white clouds.

They arrived on time for their appointment. The KBI receptionist took

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them to the office of a dark-haired mnemograph specialist named Karen Vela. There was an observer there from the ACLU; a man from the DA's office came in late, hurrying. The press had been notified but none showed.

Karen Vela briefed all of them on the procedure in her office. The two observers sat at the back and said little. Dan and Chun, still cuffed, sat together on a couch against a side wall. Chun listened attentively but said nothing.

"The test works best if the subject is relaxed," Karen concluded pleasantly. "You gentlemen may observe from the next room. I have your list of questions, which I will intersperse with my own." She picked it up from her desk and stood.

"Sorry," said Dan, also rising. "He's a suspect in a killing. One of us will have to remain in the room. Procedure."

"Oh, yes." She smiled apologetically. "These regulations come and go from time to time. Since you're the one already cuffed to him . . ."

"We'll watch from the other room," Ron finished. "Shall we go?"

Dan led Chun after her into the interrogation room. It reminded him of a lobby in miniature, comfortably furnished with a recliner, several easy chairs, and a corner table with a lamp. A small electronic unit sat on a bookshelf among potted plants. That and the large, horizontal wall mirror through which the observers would watch them were the only oddities in the room.

"How oddly quaint," said Chun, turning around to look. In the process, he twisted Dan's arm awkwardly.

Dan bumped up against him and then turned to extricate himself.

"No white lab coat?" Chun asked Karen, looking over her gray suit and white ruffled blouse.

"No. Please sit down in the recliner." Karen bent down slightly and began to pull wires from the unit on the shelf and to arrange the headset, which was no more than a spidery arrangement of wires and sensors that would fit over his head.

"Ah. Of course." Chun turned around again, bumping into her hips as he looked over the recliner. He turned even more in that direction and then sat down.

"You'll have to get up," Dan said wearily. "I'm on the wrong side. My chair is over there."

"Oh, yes. Quite so." Chun smiled nicely and got up and turned again, threatening to drag Dan over the recliner bodily.

Dan jerked his arm back hard, glaring at him.

Karen straightened, eyeing Dan with disapproval.

"Is that a blue neon coleus?" Chun asked suddenly, picking up a small potted plant. "I had heard this had been bred, but I have never seen one before."

"Sit down, please," Karen said firmly.

Chun sat straight down on the recliner, still studying the plant, leaving Dan where he was.

Grimly, Dan grabbed Chun's lapels and, mindful of his age and the observers, gently lifted him into the air. He shuffled around the recliner, holding up Chun and the plant, until they were both in the position Dan wanted. Then he let Chun down, releasing him just a little

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above the recliner. Dan felt a twinge of satisfaction as Chun was mildly jarred by his landing.

"We're running late, are we?" Chun asked, as Karen started fitting the headset over him.

"Of course not," said Dan, reflexively glancing at his free wrist for his watch. It was gone. "That's funny. I—"

"Hey!" Karen jumped back angrily from Chun.

Dan looked up, yanking firmly on Chun's cuffed arm. "What happened?"

"He pinched me!"

"Huh? You didn't have your back to him."

"He didn't pinch me back there," she said through her teeth. "If you can't control your prisoner—"

"All right, all right." Dan stood up to loom over Chun and stare into his eyes. "I'll watch him."

"Time for the rubber hose?" Chun asked innocently.

Karen took the potted plant from Chun and turned to replace it on the shelf.

"Now, look," said Dan. "If we have to strap you down, I can arrange that. I'd rather not—"

Karen whooped again, whirling around. "He pinched me again! Back there this time."

"Stand over there," Dan ordered. "I'll cuff him to the chair." He reached for his keys with one hand and raised his other wrist to uncuff himself. Then he stopped, looking at his other bare wrist in surprise.

"I'm stuck," said Karen, looking down at her ankle.

Dan looked down. Her ankle was now handcuffed to one leg of the recliner. "Hang on." He knelt down to unlock her and found that he was holding a slim wristwatch he had never seen before instead of his keys.

"Say, that's mine," she said in surprise. She bent down to take it from him and blinked, straightening suddenly. Then she reached into the front of her blouse and pulled out Dan's very full ring of keys.

Dan traded with her, taking a deep breath. When he had released her, he stood up and glared at Chun again. Chun looked back, his eyes innocently wide.

"You want a conviction that bad?" Dan growled angrily, with all the practice of a lifetime in law enforcement. "I've got half a mind to throw you to the wolves after all."

"Where's the other half?" Chun asked.

"*That*—" Dan inhaled sharply as he stopped himself. He had been about to say, "That does it," but of course that was what Chun had wanted all along, to be thrown into the briar patch. Clenching his teeth, Dan cuffed Chun's hands together behind his back.

"I read in your dossier that you were a sleight-of-hand specialist," said Dan. "You're very good. But you've put me in a very bad mood." He suspected the muffled sound he heard was Ron and the others laughing in the next room.

Chun smiled sweetly up at Karen, who was standing safely out of reach, even now.

"Go ahead," said Dan, sitting down again. "Let's get this over with."

"By all means," said Chun.

Once Karen had fitted the headpiece on him, the process was similar to the

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old polygraph procedures that Dan had read about years ago, before they had been outlawed completely. She asked him simple questions to which the answers were known, such as what clothes he was wearing and what city they were in, having him answer truthfully to some and falsely to others. Once she had the readings on his memory pathways and brain waves, she asked the pertinent questions from the list Ron had given her the day before. Though the process was old, the principle was completely different.

And reliable this time, Dan remembered.

His mood had relaxed by the time the interrogation ended. She had included questions about Chun's background, sprinkling in more detailed ones about the Henderson case in particular. Her central question was repeated several times: "Did you kill Joe Henderson?"

"Yes," said Chun, every time.

"No, you didn't," said Karen, after the last time. She looked at Dan. "No question. He's innocent. According to the responses I received on related questions, I would say that he had no acquaintance with Henderson or any other connection."

"That's what I thought." Dan nodded, looking him over. "He just wants to live out the rest of his years being cared for, probably in a minimum-security facility because of his age."

"If I were to receive all the time deserved for all the charges I have ever had leveled my way," said Chun, "that would be more than sufficient. How ironic that I spent so many years avoiding just that."

"Yeah, I'll give you that." Dan grinned. "Mr. Chun, in a way I don't blame you for trying this. But I'll have to let you go. Come on."

Ron met them in the lobby, smiling broadly. The observers had departed, no doubt cheerfully. "That was quite a show you put on, Mr. Chun."

"It was insufficient in the end." Chun shrugged.

"Dan," said Ron, "we'll have to notify the county lockup we signed him out of that we're letting him go. We can release him here in Topeka or we could take him back to our office and let him go there."

"It's up to you." Dan said to Chun.

"This is as good a place as any, I suppose," said Chun. "The restaurants here are better than the ones out on the open road."

"I'll call it in. Let him go." Ron moved toward the receptionist's desk.

"You have any money?" Dan asked, as he took the cuffs off.

"No," said Chun. "However, in my life, that is a perennial obstacle and yet never a problem." He rubbed his thin wrists.

"All right. There you are." Dan stepped back with the cuffs.

"Of course," Chun said thoughtfully, "Brutus and I were really hoping to save the Republic. Our victim has gotten all the best press, yet he was a dictator and a manipulator whom we had to eliminate in whatever way we could—"

"Sorry," said Dan, grinning. "You didn't kill Julius Caesar, either. Even you aren't that old."

"Ah, but the Whitechapel murders aren't nearly that old. And the public cries out for a solution even today.

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Wouldn't you like to have the credit for arresting—"

"Jack the Ripper?" Dan laughed. "Sorry."

"The Lindbergh kidnapping? The Jack Ruby killing?"

Chuckling and shaking his head, Dan put his arm around Chun and led him to the door.

"Sabotage of the NCI food processing factory in Wichita? The Murdock horse-snatching by aircar?"

"That's rustling, city boy. Goodbye, Mr. Chun." Dan gently shoved him out the door and walked back toward Ron, still grinning.

"We're all clear," said Ron, clicking off the phone. "Let's get some lunch."

"You know," said Dan. "I still like the guy. I was tempted to let him get away with it, but . . ."

"I know. We can't, not with the mnemograph records on file. As cops, we've surrendered another piece of individual discretion. Not to mention the failure of ethics." Ron came alongside him and gazed out the window.

"And the weird thing is, he's almost certainly guilty of all kinds of crimes he was never caught for." Dan paused. "You know, that mnemograph really is an important tool. Maybe it won't be outlawed. I hope it won't."

"You're joining the ranks of the converted?" Ron punched him playfully in the arm. "The tired old dinosaur himself?"

"It's going to change the entire range of due process of criminal investigation and prosecution. Exit the Fifth Amendment—no longer needed! Do you realize just how much of our procedure is based on separating truth from lie and protecting the innocent from the fate of the guilty?"

"Like Chun said, though, the guilty will want to hang on to their legal tools and maneuvers."

"They'll keep them for a long while yet," Dan said grimly. "But, you know . . . for the first time in years, I think we have hope. If justice is the goal of all our rights and procedures, that box is going to win out eventually." He slapped a fist into his other palm. "Come on, let's get back to the office. I want to get on the phone to some people."

"Maybe we can try it again soon," said Ron, looking up at the sky outside the window. "Dan, do you have your keys?"

"Yeah." Dan patted the flat emptiness of his pocket, remembering with horror his physical contact with Chun a moment ago.

"Chun just flew away in your aircar." ■

●The ultimate "black hole" may be the universe itself.

Herbert Gursky

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THE LAST DEFENDER

J. Brian Clarke

Personal philosophies are largely shaped by cultural conditioning—but personal experience can be even more important.

Janet Aulisio

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A billion kilometers across, the enormous spiral of matter flares incandescent as its substance is inconceivably compressed and energized just before it disappears forever below the event horizon of the black hole. The Ark is already being drawn inexorably inward; subject to nature's relentless laws as surely as every atom within range of the voracious center. The only choice for the thousands aboard the converted asteroid seems to be in the manner of their dying. Quickly, as their bodies become stretched and torn apart by the tidal forces of the hole. Or slowly and without hope, on the cratered surface of a tiny world which eons ago was captured and spun into an elongated orbit about the fearsome primary.

Yet even among the doomed, there are optimists—

'The theory says it can be done!'

'You forget the calculations are impossibly complex. There is not enough time.'

'Nevertheless we will depart at the appointed moment. The Giver will guide our steering.'

'I wish you luck, brother. Some of us have chosen to go to the planetoid, where time will perhaps grant us a better way.'

'Time belongs to the Giver. He will grant you nothing.'

'Or everything.'

The moment comes. Like a cloud of disturbed locusts thousands of tiny space craft separate from the Ark, rotate, and then spiral toward the primary along a course which leads them high above the ecliptic. Again they rotate, and with drives flaring at full thrust the little ships hurtle suicidally down the lines of force which reach out from the spinning nothingness at the center. The ships vanish.

Months later, two hundred more ships rise; this time from the planetoid which has been their temporary base. As those who have gone before, they also spiral above the ecliptic. They rotate. They dive—

Young Emma was astonished. "Another race of Silvers?"

Gia Mayland shook her head. "Not quite. But a people so closely resembling your own, they could be mistaken as such."

"How is that possible?"

"Who knows? It is a big universe with much room for coincidence. And do not forget we are only talking about physical resemblance. Within their heads, they may be as alien as anything we are likely to find in the galaxy."

Again Emma compared the hologram with her reflection in the mirror. The same lithe, fur-covered body. Similar upright ears, yellow eyes and fanged jaw. But the other being's body fur was a golden brown, not Emma's gray. And the arms were single-elbowed like those of a human; unlike the double-jointed arrangement of Emma's incredibly dexterous upper limbs. And were not those eyes smaller and set deeper into the skull? And that longer forehead—

"No," Emma said firmly. "That is quite definitely not a Silver." She smiled, displaying a fearsome display of natural weaponry. "I know. We will call them Golds!"

The woman smiled. "Not what I would call original. But it will do."

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* * *

Nine weeks later, the *Mixmaster* emerged above a cratered plain and instantly began to fall as its airfoils found only vacuum. With a brief spurt from steering jets, the nose lifted, the stern thrusters flared, and the shuttle lowered to a gentle tail-first touchdown amid a churning cloud of brown dust.

This was a new facility without the amenities that elsewhere would allow direct disembarkation through a sealed link tube. Here it was done in the old fashioned manner, involving a space-suited walk across a couple of hundred meters of lava rock to the hemisphere of the research station. Beta hung low in the black sky, the lower limb of its cloudy crescent almost touching the jagged horizon of this single small moon of the planet.

Gia glanced up along the soaring column which supported the looming underside of the nexus bowl. From this angle the bowl eclipsed the flickering sphere of light which was the nexus itself—out of which the *Mixmaster* had emerged after an instantaneous jump of almost two thousand light-years. She wondered aloud, "How do the people on the planet explain the point of light on their Moon?"

Henry Sorenson chuckled. "They don't. The nexus works only when this side of the Moon is illuminated, so the—ah—Golds have never seen it against the dark. As far as I know, this is the only photosensitive terminal in the galaxy. Which means the builders must have anticipated that eventually there would be someone up there—" He gestured at the planet in the sky, "—who would be smart enough to figure what belongs and what doesn't. Sort of like planning for the long haul, huh?"

"Henry, you have a natural gift for understatement," Gia muttered, half to herself. She wondered if there could be any reasonable definition of the kind of intelligence which anticipated and built for events millions of years in the future. On this world and on countless others, their giant machines had not only remained functional, but the towering four-kilometer pylons which supported the nearly-as-wide nexus bowls had remained straight and true, even as eons of geological change shifted landscapes beneath and around them.

Gia and Sorenson moved on. But Emma remained rooted to the spot, her yellow eyes wide behind the bubble front of her helmet. Like most people who had become accustomed to the incredible transport system which linked the galaxy in a web of instantaneous travel, the young Silver had not given much thought to the long-vanished race which had created this technological miracle. But Sorenson's remarks had triggered in her an appreciation of the awesome abilities of the beings. At a time when the ancestral life of her kind was still emerging out of the primeval ooze, the beings had created what the bureaucrats of two worlds unimaginatively listed as Alien Artifacts, or "AAs."

"Emma?"

"Coming, Mamma Gia." As she trotted to catch up with the two humans, Emma could not resist turning in her tracks and gazing once more at what, until now, had only been background in her life. But an hour later, in a small conference room within the station, her

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sparked interest in the AAs was put aside for something much more immediate.

"You want me to be a—" She blinked. "—Gold?"

"I am sorry I did not tell you earlier, dear. But I needed time to decide if you were ready. If you were not, you would have returned to Alchemy without knowing of the assignment. There are graduates who are a little older than you, with more experie—"

"No way!" Emma was indignant. "Compared to me, the others are twits!"

Sorenson chuckled. Emma was, in human terms, an exuberant teenager with equivalent opinions. In any case, for a "tame" Silver who, with a few dozen others, was being trained by Project Alchemy to deal with those of her own species who were engaged in a mad crusade to destroy all life other than their own, this particular assignment was little more than requiring her to be a tourist. But because it would not be kind to remind Emma that it was only because of her relative lack of experience that she was being offered the job, he silently agreed with Gia to let the youngster continue with her illusions.

"So what do you want me to do on Beta?" Emma asked.

Gia touched a switch. The back wall of the small room illuminated with the image of a large island. A chain of ice-bound mountains rimmed its heavily indented west coast, and a broad delta emptied the silty contents of a complex river system into the southern ocean. "That island is completely lifeless," the woman said. "Coast to coast, beach to mountain top, lake to prairie. There is nothing which grows, crawls, walks or flies. Not an insect. Not even algae."

Emma frowned. "So?"

Gia adjusted the zoom control. The field broadened and rolled eastward, revealing the western coast line of an enormous continent which girdled two-thirds of the planet. From this angle the island was a smudge on the horizon, isolated behind a wide ocean strait.

Gia pointed to areas on the main land mass. "Look at that, Emma. Verdant grass lands, forests, and right there—see those smudges? Those are towns. And there, and there—" Her finger traced a pattern of tiny squares surrounding the towns. "—indications of a thriving agricultural economy. But across from the island—" She rolled the image west again, and her hand swept in an arc, down the continent's edge. "Again, null life. Whatever the cause, it was obviously not stopped by a few hundred kilometers of ocean."

Sorenson said, "You should know, young person, that all those lifeless areas are slightly radioactive."

Emma's eyes widened. "A nuclear war?" It was a natural reaction. Emma had, after all, been raised with full knowledge of the ultimate violence. But despite her abhorrence of the subject, she was wise enough to know that nothing unpleasant will go away just because it is ignored.

Gia smiled. "The Golds have not even discovered the steam engine, so I hardly think it is likely they have been throwing nukes at each other. And because it is impossible for any ark of the Silvers to be within a thousand lights, neither can it be the result of a deliberate dusting from space."

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"Unless, of course, there are races in this galaxy we do not know about yet," Sorenson suggested seriously. He spread his hands. "Who is to say there is not one perhaps even more hell-bent than our friends in the arks?"

A look of irritation fleeted across Gia Mayland's middle-aged yet still attractive features. In many ways Sorenson's tendency to remind her of the obvious brought to mind her husband, Jase Kurber, who was presently on assignment on Bueller's World. But what would merely be a loving difference of opinion with Jase (usually resolved in her favor), here it had to be treated more diplomatically. In any case, her colleague had raised a valid point. "At this stage, I favor a less dramatic explanation. A comet-strike, for instance."

The door of the room opened and a head poked inside. "Expediter Mayland? T-call from Alchemy."

She got up. "It's probably David."

"Can I come?" Emma asked eagerly.

Gia chuckled. "You had better. I don't think David would forgive me if I did not let him talk to his star pupil."

The tachyon communicator, that power hungry beast which made interstellar communication possible although still inordinately expensive, was glowing on all indicators as Gia, the young Silver, and Sorenson watched the holographic image of a canine being with wise eyes form in the air before them. From the start, the eyes remained focused on Emma. "She iss to go?"

Gia nodded. "Yes."

"You zink iss wise?"

"I am ready!" Emma declared stoutly. "I love you papa David, but even you cannot keep me off Beta now!"

Davakinapwottapellazanzis twitched his jaw in the Phuili equivalent of a smile. He had also trained the older Emma, and the similarities between that one and her precocious offspring extended far beyond the mere fact that they shared the same name. "Young one, I zink I not dare twy." The image turned to his old friend. "Gia, make sure she do what you say."

Gia respected and in many ways looked up to her Phuili colleague. In fact, it was almost startling to realize there had been a time when she thought of David as "alien." Yet even now, after their years together in Project Alchemy, he could still amaze her with his uncanny ability to penetrate below the innate savagery of his young pupils, to the lively and loving personalities which hundreds of generations of conflict with legions of Silver-hungry predators had failed to completely eradicate. Alchemy's success with the young Silvers was a strong indication that perhaps their implacably anti-life cousins could also be turned, with the consequent corollary that the Project's graduates offered the only chance to save the still precarious Phuili-human alliance from the divisive consequences of completing what had already been started. Genocide is not, after all, a proud accomplishment. Although joint action by Phuili and human ships had destroyed the Silvers's home world, many of that race still survived—preserved in stasis within the hollow cores of fifty or so "arks" which were drifting at sub-light toward neighboring suns. But if the Silvers from the Project could not turn the wild ones aside from their unholy *jihad,* then even the continued existence of the yel-

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low-eyes of Alchemy could hardly atone for the fusion-tipped inevitably that would certainly be launched against the tens of thousands aboard the arks.

"If Emma does not exactly follow instructions," Gia remarked gravely, "there is a strong possibility she will not survive long enough to regret it."

Emma suddenly felt very lonely. For the first time in her young life she was being allowed to make a decision which affected her life, and she knew that Mamma Gia's warning was one of cold, serious possibility. Although, she wondered, what is so terrible on Beta?

"Perhaps nothing," Mamma Gia replied. "And if you remember what we have taught you, I am sure there is little to fear. Nevertheless, there is no place in this universe that is entirely free from risk."

"But Mamma Gia, you still have not told me what I am supposed to do there!"

"Mix with the people. Look around. You will have an implant, so you will not be alone."

"What about language? Customs?"

"Hypno training. A few months ago, we landed a team on Beta and 'borrowed' one of the natives. The poor creature lost a couple of days from her life and probably still has a few bad dreams. But there was no permanent harm, and we did gain sufficient data to make you into a passable imitation."

Emma flexed her arms, bending them like pretzels. "But what about this? Every time I move, they will know I am different."

The image of her old Phuili teacher said, "Not difficult to make one arm joint not to move. What iss difficult iss for you to play pwoper part, so we can know what happen on Beta. Especially what make wadioactive. People pwimitive by our standards, not know technology. But whatever happens, zey will at least have legends. You listen and learn zose legends."

It made sense. Even as David signed off (promising he would call frequently during the mission), Gia was already entering questions into her handcom:

In what terms does a primitive eyewitness describe a collision from space, for instance? As an act of a vengeful god? A retribution for past sins? Would there be a religious interdict against any discussion of the subject? If so, how does Emma find out facts without exposing herself to the holy wrath of a local equivalent of the Inquisition? And dare we permit her to visit the contaminated areas of the west coast?

The last question was not entirely theoretical. They had the means to make Emma radiation immune for a period of a week or so, although if the youngster was still in the contaminated area when the treatment wore off, she would be far worse off—perhaps fatally—than if she had not received the treatment in the first place. But even after Emma read Gia's notes, that possibility did not bother the young Silver. "I know I am young, Mamma Gia. But I am not stupid. How often have you told me that half a truth is worse than no truth at all? So how can we learn what happened on Beta without information from the wastelands?"

Gia hesitated. But she had no choice and she knew it. Finally, she said briefly, "I will have the lab set it up."

* * *

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Emma was landed in a quiet wilderness valley less than a day's hike from a mid-sized market town. She had been given six days (which had to include a trip to the contaminated strip on the west coast) to complete a mission in which the only specific instructions had been to "look, listen and be careful."

The immobilization of her lower elbows was a temporary procedure which would be reversed when her mission was done, and physically there was no discomfort. Nevertheless, Emma felt like a freak as she awkwardly settled the pack over her shoulders and began to walk out of the valley. The Golds would undoubtedly notice the disproportionate length of her lower arms, although it was doubtful they would think it anything more unusual than the aberrations which were already common among the younger folk up to the equivalent of Emma's age. The gentle psychic probing of the captured native had been for no other purpose other than that of revealing language. But a few facts delved from the surface of the slumbering mind, had revealed this one great concern of those who had been parenting since the time of "the lights."

Emma had only been walking for an hour, enjoying the sights and sounds of the landscape and breathing the crisp air, when she met her first Golds. They were squatting by the side of the trail, both still and silent as furry statues. For a moment Emma was tempted to retreat, but held her ground when she sensed the two were fully aware of her presence. So she advanced and stopped before them. "How far is the town?"

Slowly a head turned and a pair of rheumy yellow eyes regarded her curiously. "You not know?"

Emma shrugged. "I explored. I got lost."

"We had one like you," the female said. "Then she died."

"We come here to pray to the ones who sent the lights," the old male explained. "We want to tell them not to take any more of our children." He added, "For a moment, I thought that perhaps you—" He shrugged resignedly.

Emma's heart hammered. Had she found the answer so soon? She took a deep breath. "I am very ignorant. What lights?"

Grunting with effort, the two Golds got to their feet. All their movements were slow. "You may come with us to Weebharn. It is not far and we can talk."

A voice whispered in Emma's skull. *'An excellent opportunity. Go with them, but do not forget that we still know only a bare minimum of their ethics and customs. In your situation, it is wiser to listen than to talk.'*

Sound advice. But Mama Gia was on the watch ship, in synchronous orbit twenty thousand kilometers above the planet. Although the human could see and hear via Emma's implant, even that miracle of miniaturization could not transmit the empathy with which Emma could sense the sorrow and loneliness of these two beings. Impulsively, Emma grasped the female's hand and then just as swiftly dropped it. The specialized nerve endings in the palms of a Silver's hands were the unique channel by which any two individuals of that species could *secret talk* with absolute security; a rar-

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ity in a universe in which sound or visual signals did not possess such exclusivity. For only a moment, Emma had been fooled by the physical similarity of the Golds to her own kind. But the deadness of that brief contact was proof that the natives of Beta were indeed as physically alien to her as humans and Phuili.

"I will come with you," Emma said, wishing for the presence of another Silver with whom she could hand-touch her own loneliness and doubts. Not even Mama Gia or Papa David could fulfill that need, although scientists had developed a computerized glove which helped. But if she was patient and did what she was supposed to do, it would not be long before she could wash this alien color out of her fur and return to her brothers and sisters of Alchemy.

But Emma quickly discovered the difficulty of listening and not talking, as instead of imparting information, the two Golds garrulously plied her with questions. Fortunately, like most oldsters they had a short attention span and seemed to accept Emma's explanation that she and her family had recently moved her from another place; a flat place, she added, which did not have all these confusing hills and valleys. The young Silver also pretended to be a little stupid, which again was accepted as not being particularly abnormal. Only when Emma kept on throwing in a persistent "What lights?" did the male finally turn to her and ask puzzledly, "But I thought everyone in the world knew about the lights."

"I don't. What are they?"

"Things which happened probably before you were born, young one. Lights that flew in the sky, others which fell from the sky to the ground, and still more which rose from the ground into the sky. It all happened in the west, above the lands which later died and grew no crops."

The female nodded. "And when it was over, fools that we were, we thought it was over. But how were we to know that from that time on many of our young would be stillborn? Or if alive, not like the healthy young we have borne since the beginning of time?" Touching Emma on the head, she added sadly, "Too many are like you, young one."

Emma held out an oddly-elbowed arm. "Even like this?"

The male nodded. "Do not be ashamed. There are much worse. I remember a herder who told me about a woman who gave birth to a male child with two heads." He shrugged. "I suppose it is possible the herder was telling a tale. But even so, I am beginning to think such horrors are possible."

Emma was angry. *'Mama?'*

'I heard, dear. But when we immobilized your lower elbows, we had no idea things were so bad. It was an honest mistake with no other purpose than to ensure your safety. Anyway, it is evident that radiation levels may be higher than originally calculated. So please do not be surprised if we recall you to the rendezvous point earlier than scheduled.'

Emma muttered an epithet she had overheard from a male human, and ignored Gia Mayland's shocked, *'Emma!'* Of course there had always been a time restraint anyway, so the only change must be to move a little faster and push a little harder. Although there was not

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much she could do about the shambling pace set by the elderly Golds as they plodded down the narrow path.

Finally, they arrived at the untidy collection of timber-built dwellings and trade houses which was the town called Weebharn. Emma was touched by the old folk's offer of a meal and a bed, but needed no prompting from Sorenson (who had taken over from Mama Gia) to move on. She went on alone down a dirty side street to the river, where hopefully she could get a ride downstream toward the deadlands.

The citizens of Weebharn were a scruffy lot which, presuming they were typical, would seem to further distinguish Golds from the always fastidious Silvers. Emma had let her own once glossy fur become uncombed and dirty; a particular discomfort which in this case did at least have the virtue of necessity. She sat on a crude bench outside a waterfront tavern and gnawed some of the food from her pack as she watched the activity around the boats which were pulled up on the littered shore. There was a lot of haggling going on, especially next to a craft with a wide cargo-carrying deck atop twin hulls. The boatman, a squat Gold wearing a stained loincloth and with what looked like layers of rusty chain slung around his thick neck, had apparently refused to load a heap of sacks and wood boxes without the help of the customer who had brought the load down to the shore. The customer, an individual who was slightly cleaner than most and who apparently thought of himself as superior to all, was refusing with an exaggerated haughtiness that made Emma smile despite herself.

'It seems some things are universal,' a voice murmured.

Emma's smile widened, causing her fangs to glitter in the sunlight. *'Are you admitting that humans are also like that, Papa Henry?'*

'Are you implying that Silvers are not?' Sorenson retorted good humoredly.

Emma rose to her feet and walked toward the shore. *'I have an idea.'*

'The same thought has occurred to me. Just be careful what you say.'

"I am always careful what I say," the young Silver muttered, not entirely honestly. "Excuse me, noble ones. May I be of help?"

The boatman turned his hostile glare on Emma. "Doing what?"

"I am looking for a ride downstream. If I help load the lordship's goods, will you take me with you?"

The "lordship" looked interested. "Young one, there is nothing downstream except deadlands and exiles who will not live long." He gestured at the piled goods. "Although I will sell these for a fat profit, I will be back here soon enough to enjoy a long life and all the good things that wealth can buy." The yellow eyes narrowed as he noted the apparent deformity of the young female's arms. He pointed. "You are not as bad as most, and indeed you almost sound intelligent. Instead of wasting your life with those who are already wasted, I offer employment in my House of Geriac. Your duties will be few. And, I think—" His jaws opened with an unpleasant grin. "—pleasant."

'My god, there really is nothing new under the sun! Emma, that one—'

Emma inwardly cringed. Although

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this was her first encounter with this type of situation, she was physically mature and recognized the signals. What made it even more unpleasant was her suspicion that the Gold was attracted by the alienness he sensed in her. The human word "kinky" came to mind, and what little knowledge she had of that race's peculiar aberrations sent a chill through her blood. Nevertheless, with a confidence she did not feel; *'I can handle it, Papa Henry. Just stay with me, please.'*

'Of course. And I have sent for Gia. This is a situation which clearly demands her delicate touch.'

Emma flashed gratitude to her distant controller as, to the Gold, she said politely, "I thank you for your kind offer, but I must join my family. The One will take care of me."

"The One only takes care of those who take care of themselves," the master of the House of Geriac commented sourly. He nodded at the boatman. "All right Karfahm, you may work this addle-brained female. If she wants to die in the deadlands, that is her stupid business."

Emma set to work with a will, helping the boatman with the larger cases and loading many of the smaller ones on her own. She discovered, both to her and Karfahm's astonishment, that despite her immobilized elbows she could lift with ease what the squat Gold could lift only with considerable effort. As the work progressed, it became evident that Geriac had also noticed—to the extent, at least, that he prudently stayed clear of her. Emma did not mind that at all, especially when he backed away as she deliberately passed close to him. Mama Gia did not approve. *'Don't provoke him,'* she warned after she saw the incident through Emma's implant. *'It is not the time to add unnecessary complications.'*

'Sorry Mama. But it pleases me to know that he knows what I will do to him if he tries anything.'

'Good! leave it at that.'

Emma fully intended to. When the boatman finally poled his craft away from the shore and then used the big stern-mounted paddle to work into midstream, Geriac sat on one of his boxes and stared rigidly ahead. Emma stayed near the boatman. She did not fully trust that unwashed individual either, but felt reasonably safe as long as he was occupied.

It was a wide, swift river with eddy currents which frequently swung them half around while Karfham swayed his sturdy body back and forth as he worked the paddle. A steady wind blew inland from the west, raising whitecaps and flapping a stray end of the big sail which was furled around the single mast. It was obvious how the boatman would bring the raft back upriver, although as they shuddered across a particularly choppy section, Emma doubted that anything less than a gale would have the energy to move even dead leaves against the current of this fierce waterway. But when they turned a bend and saw a similar twin-hulled craft close to the far shore, its sail bent rigid as it slowly moved upstream, the young Silver had to revise her opinion.

"Where you want to go?" Karfahm asked. As Emma looked at him blankly, he tucked the shaft of the steering paddle under one arm and began ticking off on

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his stubby fingers. "Aggar. People stay the longest there, it's not far into the deadlands. Bith. It isn't much, but it's the only place to shore a boat for nearly fifty klicks. Keesadak. I stop, but I also leave quick. There are bad ones in Keesadak who'd cut off your head just for not saying hello. Beyond that there's Iko. The people there are strange; I suppose because of the sickness. They have a funny sort of religion with a high priest who's sicker than any of 'em. I saw him once. Ranted and raved about life and how sacred it is. Told us not even to step on a grubber, would you believe! Said it has its place as much as a star or a pebble."

Emma subvocalized, *'Comments please?'*

Mama Gia replied, *'The town called Aggar seems the most permanent, so I suspect you will be there at least long enough to look around. With luck, the place may turn out to be a mine of information.'*

Sorenson: *'And don't forget, you are on Beta only to find out why the deadlands exist. You are not an explorer. So as soon as we judge 'mission accomplished,' you will be pulled out of there.'*

'I understand, Papa Henry.' Emma grinned mischievously. *'But it won't hurt if I look around as I go, will it?'*

Looking toward the front of the raft, she noticed Geriac's head was drooping. The noise that came from his direction indicated that snoring was snoring from any racial source. Emma's controller said, *'I know what is on your mind, and I concur. Get as much rest as you can. You will need it.'*

'But Mama—'

'Don't worry. We will watch.'

Emma did not know much about the technology that enabled someone in orbit thousands of kilometers above the planet to know what was going on around her even as she slept. But if there was a rock in Emma's life, it was her trust in Mama Gia. Nevertheless, the young Silver could not help an uneasy glance in Geriac's direction as she found a pile of loose sacking and curled upon it. They were now on a calmer part of the river, and the motion of the raft and the soft creaking of its timbers combined with the natural wisdom of her body to put her to sleep even as the nictitating membranes slid across her great yellow eyes.

Emma woke suddenly. Geriac and the boatman were struggling near the edge of the raft, with Geriac shouting, "She's a demon! Let me go you stupid peasant, let me go!"

With a sudden jerk of his thick body, Karfahm flung Geriac to the deck and then sat firmly on his chest. "You may be a high and mighty master, *master*, but do you really believe you can swim through that?" He grabbed the other's head and twisted it toward the water, where literally hundreds of heaving black shapes were riding the river shore to shore. One came close to the raft, and its riders came under the cold scrutiny of a single enormous eye atop a fleshy appendage.

Instantly alert, Emma uncoiled and sprang to her feet. "What is happening?"

Karfahm snorted as he released Geriac and went back to the paddle. He released the rope which had held it

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amidships. "You tell me, young one. While you were asleep he went up to you with something more on his mind, I think, than just to talk. But even before he laid a claw on you, he went crazy! Ran away as if you were all his nightmares in one female package!" The boatman frowned at her. "Are you a witch of some kind?"

His frightened gaze still riveted on the young female, Geriac carefully stood up and then backed away until he bumped into one of his own packing cases. He fell with an undignified spreadeagle. Karfahm laughed. "Not going to swim after all, master?"

"Ju—just keep her away from me. She's a demon!"

'Mama, did you do it?'

'Mostly he did it to himself. We just helped him along with a small program we developed from the data we recorded when we brain-scanned the captured Gold. Transmitted through your implant, it stimulated Geriac's mind to give reality to his basic fears. In his eyes, you turned into—' The image of a shrug. *'Who knows what he saw? Something, I suspect, from the Gold equivalent of what we humans call hell.'*

Emma shook her head. Geriac was definitely an unpleasant individual who deserved to be taught a severe lesson. But in this case her sense of justice left her with a guilt feeling that the punishment had far outweighed the crime.

'I don't think so,' Gia replied understandingly to Emma's expressed doubts. *'He will get over it, although not to the extent that he will continue to regard young females as possible property to be used or abused at will.'*

"Aggar," Karfahm said suddenly. He pointed.

They had rounded a bend in the river. On a narrow ledge of land which backed against a hill, was a low huddle of buildings which, even from this distance, looked more like a dumping ground for scrap than a community. The raft drifted closer, and Emma saw structures made from wood crates, driftwood, tarpaulins, rocks and plastered mud. And then her sensitive nostrils twitched as she realized that Aggar had an odor in keeping with its unprepossessing appearance.

As the twin hulls grated on the shore, the boatman threw a couple of mooring ropes to a pack of filthy youngsters who fought for the chance to receive a tossed coin. Emma moved to help unload the cargo destined for this stop, but Karfahm waved her back. "Too much cheap labor here. They'd not like anyone doing it for free." He nodded toward the town. "You might as well go ashore for a bit. The people here don't have much, but they're honest and won't take what doesn't belong to them. I'll blow the horn when I'm ready to pull out."

"All right." Emma glanced at Geriac, who tried not to show his fear with an obscene gesture which somehow seemed merely pathetic. She shrugged and jumped off the raft.

'Smells pretty bad, huh?'

'Papa Henry, how could you know that?'

'I see what you see. Gives my olfactory nerves sympathy pains.'

Smart ass, Emma thought, recollecting a favorite expression of that irritating although likeable human. She

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gingerly toed her way around reeking piles of garbage toward a large tarpaulin-walled structure outside of which two elderly females were sitting on a large log. She joined them.

The nearest female, a tattered individual with patches of dirty skin showing through the fur of her head and body, gazed with interest at the young stranger. "You from Karfahm's raft?"

Emma nodded. "I'm traveling downriver looking for my family."

"Hmm." The female turned to her friend. "Another in a hurry to get to the next world. Just like the others."

"Others?" Emma asked. "What others?"

The female sighed. "Adventure seekers. Fortune hunters looking for easy loot. Some, like you, just looking for people. But none of you seem smart enough to wonder why the deadlands are dead."

The equally tattered friend leaned forward and scrutinized Emma. "Seem different, you do." She shrugged. "Not that it matters. D'you know where you're going?"

"Only that when the lights came, my family were working the land near Pendo."

Emma had been prompted, and she hoped the story made sense. Pendo was one of the many villages which had been abandoned. For reasons which were probably a combination of superstition and fear, the Golds who returned to the deadlands had refused to reoccupy the almost intact buildings and had chosen instead to build hovel collections like Aggar.

The friend nodded wisely. "I knew Pendo. I also knew many of the families there. Under what name was yours?"

Emma thought in a hurry. "I think you would not know them. They moved there just before the lights."

"Ah."

'Ask them about the lights. Perhaps those two can add something useful.'

'Yes, Mama.' Sometimes Mama Gia was too much like a real mother; fussing and at the same time forgetting that the young silver was quite capable of thinking for herself. "You saw the lights?" Emma asked.

"We both did," the first female replied. "But I was closer."

The second female bristled. "Not much closer. I was on the Hill of Rappe, so I got a better view!"

"View of what?"

"Out there." A vague wave toward the west. "Lights. Small lights and big lights. Lights which lit up the whole sky. Some going across, some going down and some going up. There were noises, too."

"Which I also heard!" the first female interrupted, continuing what was apparently a never ending game of one upmanship between the two. "It was like distant thunder."

The second agreed. "If it wasn't for the lights, that's exactly what we'd have thought it was. Thunder. And it went on for hours."

"Through half the night and into the day," the first one added. "And when it was over, it was as if it had never been. At least, that's what we thought."

"You mean it was then the lands began to die?" Emma asked.

"That's right. And plants, and animals, and then people." A patchy arm

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waved downriver. "Young one, I know we can't stop you from going. But don't say we didn't tell you. The further you go, the worse it'll get."

Emma said, "I have heard that beyond the sea there is another big land. Perhaps it is better there."

The first female snorted. "The other side of the death?" Slowly, painfully, she shook her head. "We have all heard that tale. But no one with sense believes it. I think the fisher folk started it. They were always born liars."

A coarse laugh from the second female. "And if lies are sins, then they sure paid the price. We don't eat much sea fish any more because there's hardly a liar left to catch it!"

There was a horn blast from the shore. Emma politely thanked the oldsters who, as they watched her leave—

"We'll meet again, young'un. But not in this world!"

"Not very subtle, are they?"

"Life in that mess of hovels is hardly likely to breed subtlety, my unsubtle colleague." Gia Mayland yawned, removed the headset and stretched to ease her aching neck and shoulders. "If I did not know any better, I could easily imagine that two opposing sides have been throwing missiles at each other."

Sorenson nodded thoughtfully. "You know, Gia, the bit about lights 'going up' really got to me. Remember? We have heard it before."

She glanced sideways at him. "All right. Who against whom?"

He managed a chuckle. "If it ain't Silvers—"

Gia sighed."I know. The possibilities are terrifying." She touched a switch. "Please warm up the T-com. I want a conference call with Alchemy and Expediters Central."

Gia Mayland had not exaggerated when she described the possibilities as terrifying. Nevertheless there was no need to unnerve the youngster on Beta as she continued the journey downriver; stopping at shore-hugging settlements where haggard, sad-eyed Golds were fighting a losing battle against the insidious killer which they breathed, ate, drank and lived upon—the land itself. Meanwhile, on two worlds hundreds of light-years from Beta and even further from each other, weapons of mass destruction were unsealed from storage vaults, and shipped to a third world on which the xenophobes of two races warily restrained their dislike of each other. In their separate ways, the humans and Phuili of Groombra Four were proud of the fact that they were civilization's secret corps of shock troops; organized for a role their respective masters would never publicly admit was necessary. Yet within hours real time, after Gia Mayland had completed the T-com conference call, a shuttle delivered the weapons through the Groombra gate. Mutual race-oriented antagonisms were immediately put aside as trained crews installed the death-dealing hardware in the weapon bays of an orbiting oddity which was neither shuttle nor starship, yet contained elements of both. As transportation through the gates, or in air or in space, the *Starvenger* was inelegant and inefficient. But as a machine designed for destruction, it was adequate enough for the cold-eyed fanatics who regarded

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themselves as the only bulwark against a hostile universe.

When the work was done, humans and Phuili went to their separate sections of the ship. For a while at least, they were prepared to endure this close proximity to each other. Somewhere their services were needed, and when the call came—

Karfahm had not mentioned the tinier places where they stopped for barely minutes. Often the raft did not even touch shore, as small packages of food were thrown into the shallows and picked up by emaciated Golds who staggered and weaved as they dodged the river predators that seemed to be waiting for just this opportunity. "If they want to risk their necks," the boatman explained coldly, "that's their problem. I don't intend to stay around and risk mine."

"What are they doing here? How do they pay you?"

Karfahm jerked his head toward the raft's other passenger. "He pays me. There's loot to be had out there and he gives 'em just enough to keep going. Promises a percentage of whatever they find."

"Does he keep his promise?"

Karfahm shrugged. "Ask him."

Emma did not ask and Geriac did not volunteer. But there seemed less fright in his eyes as he watched the cause of his humiliation.

Another destination came into view, to the eyes and nose the same miserable collection of hovels and decay that was becoming too familiar on this dreary waterway. But about fifty meters from the shore, Karfahm heaved out a stone anchor and the raft swung to a stop in the slow current. A silent line of Golds gathered near the greasy edge of the water and waited. Karfahm also seemed to be waiting.

Emma asked, "Aren't we going in?"

"Depends. That is Keesadak, the bad place I told you about. I have a protection arrangement with one of the chiefs. But if he's someplace else, or has had a knife shoved in his gut, this is as close as I get." The boatman pointed. "Look at 'em. Like a pack of tooth-claws waiting their chance for a jawful of live meat."

"They do not seem any worse than others we have seen. What is so bad about them?"

"The others only scavenge. This bunch scavenges on the scavengers. And even if they don't have to kill to get what they want, that doesn't always mean they don't kill. There are some who enjoy poking iron into a warm body."

Suddenly, an unexpected voice. "Jenteen!" Geriac shouted. "I want Jenteen!"

A shuffling of bodies on the shore. One individual stepped forward. "Geriac?"

"Where is Prodeff?"

"Where you told me to put him, Geriac. In the river!" There was loud laughter.

Karfahm cursed. "You arranged this?"

"Of course." Geriac sauntered across the raft. He only glanced at Emma, although he carefully stayed clear of her reach. "Prodeff was weak. With him around, my profits were lower and the risks higher." The master of the House

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of Geriac nodded toward the beach. "So I have made an arrangement with a—ah—more efficient collector. You still have your protection, Karfahm, but with a better profit. No one can get a better bargain than that."

The boatman looked suspiciously at Geriac, then at the crowd on the shore. "The one called Jenteen! Are you still there?"

"I am here, boatman!"

"Is Geriac right? Are you now the protector of me and my raft?"

"Of course he's right! I want profit just as much as he does. Which means I need a sure and regular boatman as my opening to the inlands. You, Karfahm!"

"Hmm." Again, Karfahm looked at Geriac. Then he looked at Emma. "Makes sense," he said tentatively.

Emma did not know if he expected her to say anything, but she said it anyway. "I do not like it."

He snorted and jerked his head in the direction of Geriac. "You mean you do not like *him*, I think." He went to the edge of the raft and hauled on the anchor rope. The raft started to drift inshore.

Emma was scared. Even from this distance she could tell that the scruffy crowd on the shore was composed almost exclusively of males. She touched the boatman on the shoulder. "What happens to me?"

With a final effort, Karfahm heaved the big stone on the deck. "Good question," he puffed as he went to the steering paddle. "What does happen to her, Geriac?"

The master showed his fangs. "Is it a matter that concerns you, boatman?"

A shrug of the heavy shoulders, causing the rusty chains around his neck to rattle. "I suppose not. I'm curious, that's all."

The Silver shrank back from them both. *'Mama!'*

'I know, child. You must stall for time.'

'Use that—that thing on Geriac again.'

'Won't work, Emma. Stopping Geriac means stopping the only control you have on those savages.'

'But, Mama—'

'Beta Base is working on it. For the moment you must stall.'

Emma glanced at the sky. Beta's moon was a fuzzy patch of light behind a thin layer of cloud. How could those up there help? How could they even advise? Even Mama had just admitted she was helpless. The raft was almost to the shore now, and Emma's fear was heightened as the mob of Golds shuffled forward to the water's edge. She was certain every pair of hungry yellow eyes was focused on her. Then, as a low rumble came from dozens of throats—

"Geriac! Keep them from me and I will serve you!"

Twin hulls crunched on stones. Led by the one called Jenteen, several Golds jumped on the raft. Emma moved close to the master. "Please!"

Geriac held up both arms. "Stay!" He pointed at the cargo. "That is what you are here for. Get it off and then we will talk."

Jenteen was the biggest of the newcomers. An obscene head-dress made from the scalps of several victims was draped down behind his back, and wild daubs of color were spattered on his matted body fur. He barely glanced at the cargo before he returned his yellow

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glare to the young female. "I want *that!*"

Geriac said, "Be careful Jenteen. She has powers. She's a witch."

"That's right," Karfahm called as he threw a rope around a mooring post. "She turned Geriac into a raving idiot while he was trying to have his way with her." He laughed. "She was asleep at the time!"

Geriac snarled viciously at the boatman. "Keep your jaws locked, stonehead!"

The big Gold joined in the laughter. "Good try, but no good. Don't believe in witches, never have. I'll take her!"

"Look, I'll come ashore and we will negotiate. If you give me a good price for her, perhaps I can find more where she came from."

Some of Jenteen's followers got excited. One of them shouted, "Yes Jenteen, talk. Get us females!"

Jenteen hesitated. Like most who ruled with a combination of brutality and promises, he knew he would follow his predecessor into the river if he did not keep his ragtag collection of bandits reasonably content. Finally, grudgingly, he agreed. "We will talk."

With several well-aimed kicks, and shouting, "This female's safe enough. She's not going anywhere!" Jenteen chivied his followers off the raft. Then he and Geriac disappeared into one of the structures which straggled along the shore.

Emma sagged limply against the mast. *'Mama?'*

'Look up at the Moon, dear. Is it free of the clouds?'

The young Silver was so emotionally drained, it did not occur to her to wonder about the strangeness of the question. She looked up. *'Not yet, Mama. But there is a patch of clear sky coming.'*

'How soon, do you think?'

Suddenly Emma was angry. What had the weather to do with anything? *'Geriac's going to sell me, Mama. To that—that—'*

'Not if I can help it. Now please answer the question. When will the Moon be free of the clouds?'

Emma took a deep breath of the foul air which was wafting over the raft from Keesadak. *'Within a minute or so. Why do you want to know?'*

'Listen carefully. When Geriac and that other one come out, and as soon as the Moon is clear, I want you to point a hand at the sky and threaten them with destruction if they do not leave you alone. I will hear you and will signal action at the proper moment.'

Emma did not know what to say. Next to Papa David, Mama Gia was the sanest entity she knew. Yet this was sheer madness. Was it a psychological trick, designed to take advantage of some quirk which the natives of this planet had inherited from their even more primitive ancestors? Perhaps more had been learned from the brain-scan of that captured female than either Mama Gia or Papa Sorenson had let on. In any case, what was meant by, "will signal action"?

Again Emma looked at the sky. The cloud was thinning, revealing the Moon as a blurred disk.

Karfahm said, "They're coming back, young one. Wish I could help you more."

Surprised, Emma looked at the boatman. He was right, of course. There

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was nothing he could do for her now. Nevertheless, she was grateful. "Thank you," she said simply.

The crowd on the shore had parted to let Geriac and Jenteen through. Somehow, perhaps in the confident manner of their walk, both seemed satisfied.

At last the Moon was emerging from behind the cloud. Emma stepped to the edge of the raft and lifted an arm to the sky. "Stop!" She surprised herself with the strength of her bellow.

The Golds on the shore were even more surprised. The followers muttered and shuffled back, leaving Geriac and Jenteen standing alone. "I told you, didn't I?" Karfahm said, grinning. "She's a witch!"

After a moment's uncertainty, Geriac sneered. "Very impressive. Now what are you going to do? Turn us all into vegetables?"

"I warn you, Geriac. If you try to harm me, you will wish you had never been born." Even as she spoke the words, Emma regretted their real-life lack of dramatic impact. She had absorbed too many clichés from ancient human works of fiction.

Jenteen was equally unimpressed, as he spat on the mud of the shore and said viciously, "Perhaps I paid more than you're worth, little savage. But when I am finished with you, the lowest scum-drubber will not want what's left, even if I pay him to take it!"

'Now?' Emma whispered, wishing she knew what she was asking for.

'Now,' echoed Mama Gia.

There was a brilliant flash—

Emma staggered to her feet. Flames and black smoke were everywhere, and other than a few crisped bodies on the steaming shore, there was not a hostile Gold in sight. Karfahm crawled across the deck to her and repeatedly banged his head on the boards before her feet. Between blows he gasped, "Forgive me for thinking you were only a witch, great one. Now I know you are a god, come from beyond the sky to—"

She did not know what else to do, so she stooped and cuffed him. "Get up, idiot."

'Don't disillusion him, Emma. He's useful that way.'

"Boatman, what I am is to remain a secret between us. Do you understand?"

He lifted his head and backed away slightly. "Mighty one, anything you say. I will build an altar—"

"You will build nothing of the kind. You will attend to your normal duties as a boatman and treat me like a normal paying passenger. Is that understood?"

"Y—yes."

"Good. I am going ashore for a few minutes. When I return, we will leave."

Emma jumped off the raft. *'Mama, what happened?'*

'Perhaps the greatest laser shot in history, although closer to you than we calculated. It was aimed a few hundred meters to your right; supposedly to create enough of a spectacle to scare away the hostiles.'

Emma examined what she thought had once been Jenteen. *'I am afraid the shot did much more than scare them, Mama.'* She went to the next body. Amazingly, although there was not much of his lower half left, Geriac was still alive. But even as he looked up and

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recognized her, the yellow eyes lost their focus and then filmed over in death. *'Why don't I feel anything? All these lives—'*

There was no reply. Emma went back to the raft and helped Karfahm push it into deeper water. There was a splash nearby as something hungry arrowed inshore, but Emma easily sprang to the deck and watched with disinterest as the frustrated carnivore swam past with a flick of twin tails and disappeared.

"Iko," the boatman said.

Emma blinked at him. "Iko?"

"My last stop before returning upriver. Do you wish to go there?"

"How far? How long?"

The boatman squinted at the sky, then at the river. "Not far. We will be there before nightfall."

"Is Iko a poor place?"

"All places in deadlands are poor. But Iko more poor than most."

Emma gestured at the cargo. "Some of this was for Keesadak."

He bowed. "But you make that place gone, mistress. No point leaving goods there now."

"Exactly. So when we get to Iko, you will give Keesadak's goods to the people of Iko."

"*Give?* You mean not sell—?"

"It will be your offering to those I serve, Karfahm. Do you object?"

His neck chains rattled as the boatman vigorously shook his head. There was fear in his eyes. "Of course not, mistress. As you and the Great Ones require, it will be done."

"Good. Wake me when we are in sight of Iko."

Emma curled up on her pile of sacking. *'Mama, how am I doing?'*

'Mama's catching some well-deserved shut-eye,' Henry Sorenson replied. *'Feeling better, huh?'* When she did not answer, he added sympathetically, *'What you have just been through would have been a rough experience for even a tough old character like me. I was with Gia through the whole thing. Emma, we are proud of you.'*

'Thank you, Papa Henry.'

'It was a good thing you just did, convincing the boatman to leave Keesadak's goods at Iko. But I suggest you take care with that one. He's obviously not too smart, which means he may have a very short memory.'

'I will be careful.'

'Sweet dreams, princess.'

Gia Mayland took her seat before the blank screen. "She's still sleeping?"

"Like the babe she is. That boatman's a funny character, but as long as he continues to regard her as a visitor from his version of Valhalla, he'll guard her with his life."

Gia began to activate the equipment. "I want that child out of there." She clenched a fist and slammed it on the control desk. "Now!"

Sorenson reached over and patted the clenched fist. "It won't be long. We have to get her out within fifty hours, anyway. Remember?"

"I remember." She sighed. "Never thought I would be so selfish as to be grateful for radiation which has probably already killed tens of thousands."

Sorenson swiveled his chair and looked at the big map display on the side wall of the control cubicle. A tiny ruby light gleamed. He tapped a key and read the figures that rolled across the bottom of

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the display. "Must be a fast river current. She'll be at Iko ahead of schedule."

"By how much?"

"They will be there within an hour."

She nodded. "I think Iko will have to be it. It's as far as the boatman goes anyway, and walking won't get her much further."

"Shall I have the pinnace readied? The way things are going down there, I doubt we'll get any more information than we already have. Not from Emma, anyway."

Gia pursed her lips, then shook her head. "I know it's a longshot, but Emma will not thank us if we pull her out before all the possibilities are exhausted."

"I understand you tachyoned David about this a couple of hours ago. What did he have to say?"

"What you might expect. He's as concerned about the youngster's safety as any of us. But he is even more concerned about the evidence of high-tech conflict on the planet. By the way, he also told me that the Groombra option is primed and ready to go."

Sorenson grimaced. "I hope like hell it doesn't come to that. Those people give me the creeps."

"Amen to that." Gia Mayland touched a control. "Emma, dear. I think you had better wake up now."

The young Silver stretched. *'Are we there?'*

'Almost. Iko has to be your last stop before we pull you out, so we want you to be our eyes and ears as much as possible during the time remaining.'

'Do you know yet what those lights were all about? What caused the radioactivity?'

'We have a few ideas. Meanwhile, just do what you can. Compared to what you have already been through, I doubt you will have any more problems.'

'Oh I hope so, Mama.'

Karfahm bowed politely as Emma went to the edge of the raft and looked at Iko. "It is a poor place," the boatman told her unnecessarily. "They will welcome the extra goods from Keesadak."

There were no structures. Instead, the low sandstone cliff which rose behind the shore was pitted with holes. Rickety ladders made from tattered ropes and pieces of driftwood rose up the cliff, and wisps of smoke rose from tiny fires within some of the caves. "Lot of sick ones here," the boatman said. "But no place else for them, so they stay and get sicker."

The raft grounded. Chattering youngsters, emaciated but still lively, grabbed the tossed mooring rope and wound it around a huge boulder which had been deposited on the shore during some past glacial age. Older Golds clambered stiffly down their ladders and approached the raft. "Welcome Karfahm," one said. He looked hungrily at the piled goods on the raft. "I see you carry more than usual."

Karfahm pointed at a separate, much smaller pile. "These few are yours for normal trade." Then he waved expansively. "The rest are yours for free."

More had gathered. Others were still descending the ladders. "We are beyond jokes, boatman. Take payment for what is ours, and then be on your way."

Emma jumped off the raft. "What Karfahm said is true. Those goods were

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intended for Keesadak, which is now destroyed. Take them and be grateful."

One of the adults walked right up to her. His tired yellow eyes held a mixture of hope and caution. "Who are you?"

Another came over. It was a female, old and frail. "Look at her, Gessdin. Does she not remind you of the Holy One?"

There was a hesitation. Then the male's eyes widened. "It is so," he whispered. "Indeed, it is so."

'Mama, what is he talking about?'

'Their priest, Emma. Remember the boatman telling you about the people of Iko and their high priest? Tell them you want to meet that Holy One as soon as possible.'

Already several Golds had clambered aboard the raft and were passing sacks and boxes down to others on the shore. Karfahm was negotiating with two other locals for the small pile which was being conspicuously left until last. He called to her. "Mistress, it goes well. We can begin our return to the inlands at first light tomorrow."

It was evident Karfahm had decided that Emma's story about seeking her family had been subterfuge to conceal her godhood, and he was already basking in anticipated triumph when he returned the Great One upriver. But as Papa Henry had already warned, it would not be good to disillusion the boatman. So Emma merely waved acknowledgement and then turned to the old female. "I would like to meet your Holy One."

The female pointed a trembling arm beyond the cliff. "He lives in a bright cloth house. If you go to that high point and look in the direction of the morning sun, you will see it."

"Is he always there?"

"He is weak and does not travel much anymore. We take what food we can to him and he tells us stories about the world that should be."

"What kind of world is that?"

"One in which living things are one. One in which there are sacred laws which say that to kill, or to take what is not there to be taken, or even to eat a single grass stalk more than is necessary to survive, is a crime whose punishment waits in the afterlife."

'Ask her how long he has been preaching that doctrine!' Mama Gia sounded excited.

"When did the Holy One start telling you his stories?"

"When he first came to us."

"When was that?"

"I was younger then, and the land had only just started to die. Iko was a real village, with houses that were not filled with death. Only later did we come to the river and scratch our holes in the cliff."

"I am sorry, old one, but you do not answer my question. When did the Holy One come to you?"

"He came just after the lights. Some of us had felt their heat on our skins and were already becoming sick. It was then he came, up the valley from the west."

Emma felt a turmoil within her. She was not able to pin down any cause, other than a nagging voice in the back of her mind which insisted all the answers were with a half-mad Gold who had apparently emerged out of the heart of the radioactive wilderness.

'Emma, it is obvious from the survival

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rate that these people are very radiation tolerant. But it would have been absolutely impossible for a Gold—or any other living thing—to survive unprotected amid whatever happened in the west. Either the oldster is lying, or is confused—"

'—Or is telling the truth. Right Mama Gia?'

Emma was certain the implant in her skull was not supposed to transmit emotion. But she sensed almost a resigned shaking of Mama Gia's head. *'Find that priest, Emma. Talk to him.'*

'Talk to him about what, Mama? The lights? Anything in particular?'

'I will leave that up to you. In this case, we have agreed it would better serve the purpose of the mission if I do not tell you what to say—or how to say it.'

How to say it? What did that mean? But before she could ask, Emma felt the severing of transmission from the watch ship and knew she was on her own. Her controllers would continue to watch and listen, although for mysterious reasons of their own they had apparently decided the situation demanded her own judgment rather than theirs.

The old female had pointed to a narrow trail which meandered up the cliff beyond the caves, and Emma headed for it. For a while she was followed by a few of the chattering youngsters, but they got tired of the chase as one by one they reluctantly realized she would not talk to them. Half way up she looked back. The raft was now swarming with Golds as more of the inhabitants of Iko removed the precious free cargo. Karfahm waved at her and Emma waved back. She doubted she would see him or the raft again, although she had hardly been long enough in the company of the volatile boatman to have real regrets.

But she wished him well.

The path was crumbly but it was not steep, and in a few minutes she gained the top. It was close to nightfall and a few stars already sprinkled the sky. Beta's moon had set, but Emma knew the approximate location of the watch ship and looked in that direction. It was not visible of course, but it amused her to wonder what *they* were wondering as their screens revealed where she was looking. Then Emma turned her back to the clifftop and to the setting sun and looked east. The land was darkening, but something glittered in the distance. Fortunately this was level prairie, and the straggly mixture of dead and mutated vegetation which covered its surface concealed no animal burrows. So the young Silver made good time toward what she had heard described as a "bright cloth house." As she drew nearer, the glitter became resolved into two components; a camp fire and a tent.

About half a dozen Golds were squatting around the fire. As Emma approached, one scrambled to his feet and met her about fifty meters short of her goal. He was a thin male, with the patches of fur and naked skin which was common to those who tried to live in the deadlands. He peered at her. "You are a stranger. What business do you have with the Holy One?"

Emma hardly heard him. She was gazing with astonishment at the bright reflecting fabric of the tent, which resembled plastic rather than weave.

She straightened. She was as dirty as

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any, but by local standards she glowed with good health. She hoped that impressed him.

Emma said haughtily, "I come on holy business."

The male nervously backed away a step. "Holy business? That is easy to say. How do I know you say truth?"

She pointed at the tent. "He will know."

"Wait." The male turned and ran to the tent. Emma's hearing was keen and she heard him speak through the open flap. "Master, a strange female is here who claims she comes on holy business." He glanced back over his shoulder. "She is not like others who have come here."

There was a mumbled reply. The male stood aside and the others around the fire scrambled to their feet as the Holy One emerged. He was weak and had to hold on to the tent as he gazed toward the newcomer with fierce eyes which reflected the firelight. There was something strange about him; about the way he was holding himself upright, the peculiar angle of his arm—

Emma gasped and bounded to him, easily thrusting the disciples aside as they tried to restrain her. She said nothing, instead grasped the Holy One's free hand.

'You are of my kind! You are Silver!'

The Holy One would have fallen if she had not reached out and steadied him. The delicate system of transmitters and nerve endings in the palm of his hand rippled the ancient language. *'I thought I was the only one left alive. How did you—?'*

'Old one, I had no part in whatever happened here. I came to this planet less than four days ago.'

He sighed. It was a long, ragged sound of resignation. *'So there is a new ark and a new generation.'* Suddenly the old Silver jerked his hand free of hers. "Why did you come here, young one? Surely not merely to tell me that all of this world will soon be a lifeless cinder?"

Emma could hardly believe what she had just heard. She was still staring at the old Silver, even forgetting to call her desperation to Mama Gia as she was elbowed back by eager disciples. "Master, is it true? Is the day of cleansing finally here?"

Tentatively: *'Mama?'*

There was no reaction. Emma was still on her own. She supposed her implant could transmit the nerve signals generated by secret-talk, although—

They knew! Somehow, Mama Gia and the others had known or at least suspected the Holy One would be a Silver. But how could they have imagined such an impossibility? How could an inert mass of rock drifting at sublight — which was an ark of the Silvers—turn up in a star system thousands of lights distant? How could she now accept Papa David's teachings of a rational universe? *'Mama Gia! What do I say? What do I do?'*

Still no reply.

Emma made a decision. Again she shoved aside the disciples and grasped the old Silver's hand. *'I need answers!'*

'We both need answers, I think. And so do my poor followers.' He had recovered from his shock and was calm. He smiled at the disciples. "All your questions must and will be heard. But

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first you must allow me a few minutes of privacy with this holy messenger."

As Emma followed him into the tent, she fingered the material of the opening flap. It was, as she thought, a lightweight sophisticated material that could only have originated offplanet. Inside the tent, there was nothing other than a few blankets on the floor.

They sat, facing each other.

Emma reached out and touched a gray patch of fur amid the brown. "I think you used the wrong dye, Holy One."

He touched her immobilized lower elbow. "My name is Beranahin. After you have told me your name, young one, I would like you to tell me about those who sent you to this world."

Then they touched hands—

"Why did they land on Beta in the first place?"

"They needed certain minerals, Mama, which they could not find on the Moon. It was then they came into contact with the Betans."

"Even so, being so anti-life—."

Sorenson nodded. "It must have been a helluva shock to find beings so much like themselves."

"I think that was only part of it. It also had to do with their struggle to stay alive on the planetoid of the black sun. Beranahin told me that experience had changed them somehow. And they were rebels to start with, don't forget."

"Or merely smarter."

"That, too." The young Silver shook her head. "I wish I understood the part about the black hole."

Sorenson explained patiently, "It was a spinning black hole, Emma. Scientists have long theorized that if you enter such an object at a certain direction and velocity, you will be instantly rejected elsewhere in the universe through a so-called 'white' hole. Obviously the Silver theorists have gone further than that, postulating rejection points at space-time discontinuities whose locations can be calculated.

"Apparently their theory was not advanced enough for precise calculations. That is why the thousands who left first ended up light-weeks from the target sun. On the other hand, the few who departed later from the planetoid had used the time to refine the calculations. They literally leap-frogged those who had already gone."

Gia Mayland nodded. "And managed to arrive months earlier." She frowned. "Emma, why is it that the Betans you met did not say anything about ships landing from space?

"The landing was on the big island, Mama, which the continental Golds have not yet discovered. It was there the Silvers mounted the defenses."

The black hole, itself an antithesis to life, had yet expunged the disease of anti-life from the hearts and souls of the few who stayed, labored and ultimately triumphed within its sterile environs. Now, to preserve life, they were about to sacrifice their own.

Nevertheless, their efforts seemed pathetically inadequate considering the weight of the attack they knew was coming. But to meet that attack in space would be to reveal the true nature of the defence and its weakness.

So only one small ship lifted into the darkness, to find the fleet and then to divert it over the lesser landmass. The

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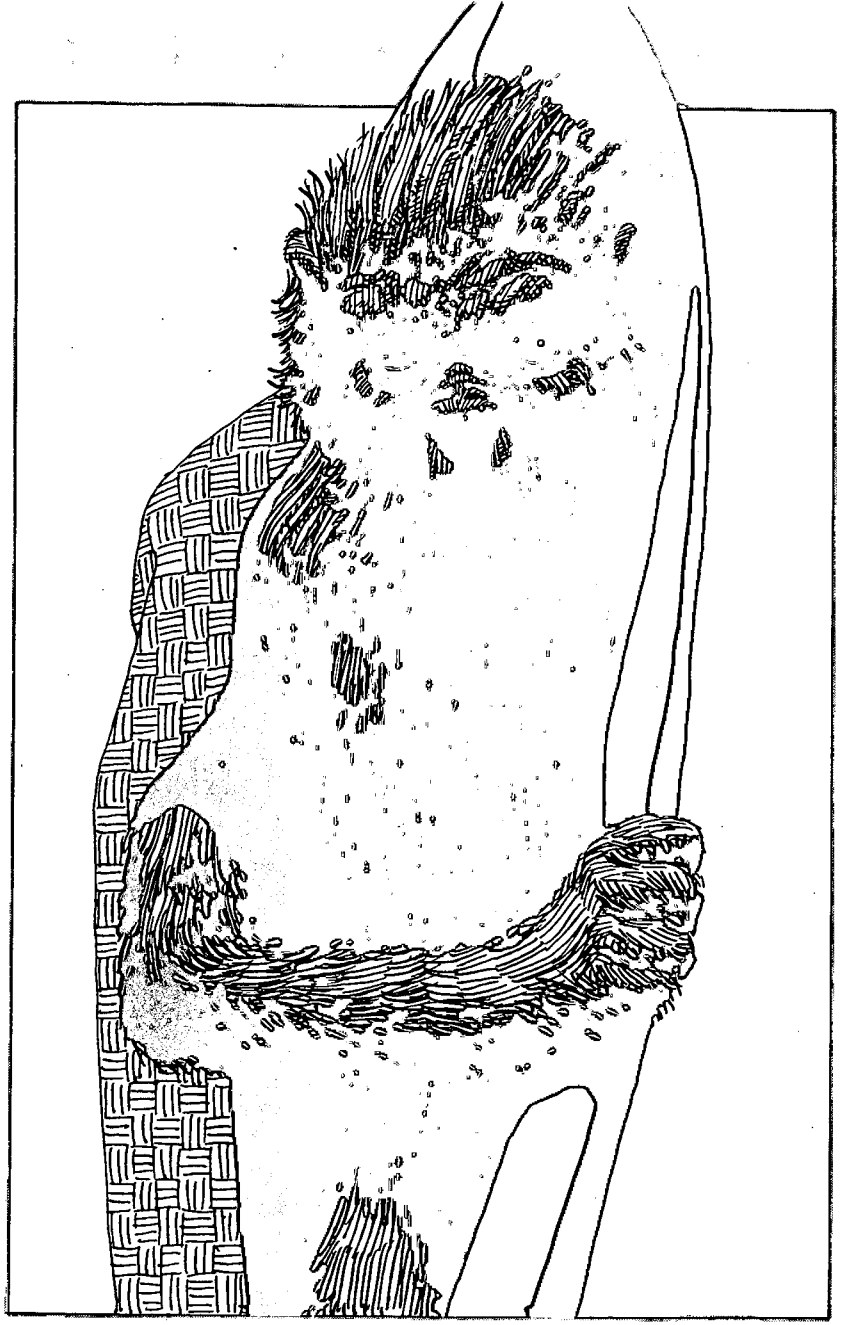

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deadly dust would fall, that much was certain. But perhaps—for a while at least—most of the planet would survive while the attackers retreated and prepared for what they would assume was an unexpected and formidable adversary. Inevitably, the fleet would return. And inevitably, the planet would die. But any gain of time would be a victory—

"And so the lights?"

"That's right, Papa Henry. Thousands of ships came down over the lesser landmass and killed it so thoroughly that nothing will live there for centuries. The weapons which had been ground-mounted from only two hundred ships did what they were supposed to and caused the attacking commanders to order a retreat before they could dust the main continent. Many Golds died, primitive folk who lived on the island. And all the defending Silvers died, except for the one who diverted the attack to the island."

"The one called Beranahin?"

Emma nodded. "He crash-landed on the continent's west coast just as some of the dust drifted across the strait. He wore a protective garment, but he discarded it after he walked inland and became the Holy One."

"—and preached the sacredness of life." Gia Mayland murmured. She shook her head with wonder. "What a turnaround."

Sorenson asked, "Emma, why wouldn't he return with you? I know we cannot save his life, but he could have spent his last days with his own kind on Alchemy."

Emma shook her head. Her yellow eyes were moist. "We are not his kind anymore, Papa Henry. He made that very clear. Beranahin is a Betan now, and will die there—on his own, or when the world dies."

Gia Mayland smiled grimly. For the second time in her career she was about to issue an order which would destroy thousands of the race to which Emma belonged. This time, however, to preserve the dream of a dying Silver, it would be done with no regrets.

The Holy One knew he had only hours left to live. They had propped him up outside his tent, facing the part of the sky where the young Silver called Emma had told him it would happen. The small radio, not needed anymore, was half melted amid the cinders of the fire.

He was not quite made of stone. He grieved for his many former friends and the thousands of others who had labored for so many years to build a new ark. Even now, the stone mountain with the ships clustered on the surface like stubby bristles on a skin, was falling inward from the system's asteroid belt. The crews were probably already on their ships, confident that with the backing of the space-born fortress they would overwhelm the planet's defenses and complete their holy task of sterilization.

They did not know of the nemesis which had already emerged out of the gate on Beta's Moon and which was converging on the asteroid. The dying Silver gazed at the triangular cluster of stars near which the young one had told him it would happen. Any second now.

The wink of light was so tiny—

Jase Kurber had returned to Alchemy

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two days before, and was now with his wife and the Phuili David as the three of them wandered through the facility. It would be good to get back to teaching after tedious months of correcting what had turned out to be a mere bureaucratic error. It seemed the Corps of Expediters was increasingly gaining a reputation as specialists in the unraveling of red tape, and that was sad. But he would wait for a while before firing off his critical—and probably useless—report to head office on Earth.

Finally they entered the class which had been his before he left on the assignment. Most of the familiar gray-furred faces were there. But one, a special one, was missing.

"Where is Emma?"

Gia coughed.

"She iss now full field operwative," David said.

Kurber looked at the little Phuili with astonishment. "That's ridiculous. She has no experience!" ■

EDITOR'S NOTE: This story is part of J. Brian Clarke's "Expediter" series.

●All the signs suggest that life exists on Mars, but we can't find any bodies.

Dr. Gerald Soffen

●The problem of modern civilization is to keep space satellites from turning into shooting stars.

Dan Bennett

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the reference library

By Tom Easton

Chronosequence, Hilbert Schenck, TOR, $17.95, 320 pp.
Walkabout Woman, Michaela Roessner, Bantam, $3.95, 276 pp.
Wetware, Rudy Rucker, Avon, $2.95, 183 pp.
Planet of the Dead, Don Wismer, Baen, $2.95, 275 pp.
Wolf Moon, Charles de Lint, NAL, $3.50, 256 pp.
The Year's Best Science Fiction: Fifth Annual Collection, Gardner Dozois, ed., St. Martin's, $12.95, xxvi + 678 pp.
The 1988 World's Best SF, Donald A. Wollheim, ed., DAW, $3.50, 303 pp.
Full Spectrum, Lou Aronica and Shawna McCarthy, Bantam, $4.95, 480 pp.
Writing Science Fiction, Christopher Evans, St. Martin's, $10.95, 96 pp.
Bio of an Ogre, Piers Anthony, Ace, $17.95, 297 pp.

I am always delighted when a book by Hilbert Schenck arrives on my desk. He has an unsurpassed knack for making that Gaean life-fluid we call Earth's blood, the sea, a character in his yarns. This isn't new, for there is a long tradition of sea tales given depth, mood, and drama by the tempers of the sea—*Moby Dick* was hardly unique—and from that tradition, as it was expressed in the old adventure pulps, sprang the SF of the 1920s and 1930s. Many of the writers were identical, and the stories differed only in their settings.

Why did the old sea tales vanish from our ken? Blame it on iron ships, which insulate the mariner from his mistress, and air travel, which lifts him beyond her reach. Blame it on the death of sail, and the decline of those trades in which human beings become intimate with the sea.

So who is Hilbert Schenck, that we should be mindful of him as he runs against the tide? The last I heard he was an oceanographer, a student of the sea, one who, even in an iron ship, lives

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close to her, sensitive to her moods, the lives within her, the link between those lives and ours. He is thus also a scientist, and he knows scientists, the ways they work and live and feel. And both of his awarenesses show up in most of his stories—technically minded people, often associated with a university, confronting some mystery related to the sea. That mystery may be political, historical or, as in the case at hand, **Chronosequence**, exobiological.

The story opens at a London book auction, where Eve Pennington, astronomer and sometime historian of science, picks up a handwritten account of certain strange events on a Nantucket islet, Muskeget, for little more reason than that she remembers that islet fondly. But then mysterious strangers, purse snatchers, and respectable academics all try to get the journal from her. Another academic type, drunk at her farewell party, reveals that an alien scout has been buried beneath Muskeget for the last two centuries, ever since its mother ship failed to return for it, that the alien must be a biological construct, and that its mission must be the collection of biological raw material for its parent race of master biological engineers. How does he know so much? There are clues in the historical record, but most of his data stem from the short time he spent on Muskeget with a lover, when he found that he could, in a drugged stupor, tap the alien's thoughts.

From this point, events move inexorably toward a stormy climax. The alien, being biological and benign, turns out to be a master manipulator, controlling the behaviors of human beings toward some end that only it can see, and responsible for all the story's many synchronicities. Yet it pays for the services it preempts with the coin of joy. This joy is the thread that links the antique journal, Eve's fond memories, the drunk's communications, and other necessary links in the chain. But this benignity is threatened, for governments have gotten wind of what is going on, seen the potential for a grand new technology of mental control, and taken steps that they hope will make the alien, and all its secrets, theirs.

Love is the key here. It is, perhaps, just the sort of coin we might expect to hold in common with other sentients (though not, of course, with all the members of an alien species, any more than we share this sentiment with all members of our own). It is certainly a coin that binds people to each other, and we see it here, again and again, and not simply with Eve Pennington and her lovers. There is also the elderly antiquarian bookseller, Ed Berry, who delights in playing secret agent on her behalf. There is Mrs. Stringfellow, who knows something of past events and happily shares that knowledge. There is Eve's friend, Julia.

There is also plenty of sexual delight, and here may be the book's major flaw. Schenck handles it too damned cutely, though even with that handicap he is fairly convincing in his renditions. What's worse, he makes it the alien's preferred coin, having that being encourage it in the people it manipulates and later reward its aides by replaying past "sweet moments," in quadraphonic stereo, yet.

Other loves, we know, can be just as rewarding as those expressed in bed. Schenck surely knows as much. Why, then, is his alien so obsessed with sex? Perhaps it finds that sex works on humans as blinders do on horses, clouding judgment and constraining options in ways that less tempestuous rewards

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would not.[1] Or perhaps it simply recognizes that *caritas* and *agape*, while fine and lovely things, do not motivate quite as well as *eros*. Just ask your nearest teenager.

Michaela Roessner's first novel, **Walkabout Woman**, is a marvelously inventive fantasy inextricably and essentially rooted in the concept of the Dreamtime of Australia's Aborigines. Its heroine, Raba, has a form of what we might call the second sight. As a child, she sees a playmate's clan spirit as the Emu, even though the boy, Huroo, is supposedly a Goanna (a large lizard), as is his mother's husband; the reason is his mother's affair with a member of the former clan. The result will be confusion in Raba's adolescent love life. The incident also introduces that lover as a plotting schemer, an evil, self-serving sorcerer.

Soon, the land claims Raba as its own. In her it inscribes a map of itself, in the paths she walks she remaps the land, in her deeds she will reforge the broken link between her people and the Dreamtime and return them all to Paradise. But the claiming is interrupted by a missionary woman who thinks she is saving the girl from death, or worse. Raba is scarred. But she manages, the scars heal in time, and then she runs head on into Huroo's love and his true father's scheming.

She spends some time in a loony bin. When she recovers, she denies her heritage, goes to college, and becomes an academic. But then—as a child she had wondered if the whites had anything like the witches of her own people, and she had fantasized about going off to seek them. Now she runs into one, who awakens her again to her destiny.

I dare say no more about the plot. Roessner is too good for me to spoil what she has to say. Her characters come alive on the page, with their greatest weaknesses being a tendency, including Raba at times, to pose like excessively noble statuary, to take on the larger-than-life poses of the mythic characters we may recall from reading Homer or Bulfinch. She is far too successful at evoking the links between a people and the world it lives in, between a people and its mythic history. She seems to subscribe to the modern myth of the noble, close-to-nature savage and the debased western urbanite, but I don't have to agree with her to applaud her skill at bringing that myth to life.

I do need to say that here is a book you are bound to enjoy.

Rudy Rucker is as zanily imaginative as anyone writing in the 1980s. His *Software* freed the robots (or boppers) on the Moon of their Asimovian restraints and initiated robotic evolution, while the big boppers, sessile mainframe-types, tried to seize control of their more mobile cousins. Now he gives us **Wetware**, in which the boppers have begun to envy humanity's meat hardware. Some seize control of humans by routing out (with a "rat") a chunk of brain and replacing it with a remote control unit; the result is a "meaty." Others dream of an actual hybridization of human and machine. They have done it with Cobb Anderson III, who invented the boppers in the first place, by disassembling his brain and recording every little detail of its structure and function, and therefore his software. They can download that software into a bopper body whenever they wish, and from

[1] Is Schenck's alien wise enough to know that if it tried to control people by arousing religious passions—potentially far *more* tempestuous than sex—the result might be counterproductive?

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time to time they do. But now they want to move the other way, loading bopper software into meat machines. And they can do it, with an artificially constructed embryo that they implant in a woman on the drug merge (which melts not just the brain, but the body as well, into jelly). The fetus secretes "gibberlins" (a nonsense word presumably intended to evoke gibberellin, the plant growth-accelerating hormone), reaches term in nine days, and thereafter matures a physical year for every temporal month. Once grown, this "Manchile" meat-bopper starts humping every human female in sight, spreading his seed with the aim of generating billions more Manchiles.

How does Manchile get around the problem of needing years to learn to speak and function? The boppers have learned to code their own software into DNA, and they have given Manchile a set of memory-loaded DNA. It shows up in his sperm, as well, and that is how his descendants are equipped with the knowledge they need.

Rucker's point is that we need to broaden our sense of humanity to include our nonbiological descendants, the artificially intelligent robots that we will soon have. No one in SF will argue with him. A few—like me—will object strenuously to his tunnel vision. Yes, he has a good sense of artificial intelligence and he is persuasive in his evocations of what a bopper's life and interests might be like. But he is depressingly ignorant of the biology he wishes to pair with his bopper software: most particularly, sperm do not carry their DNA in their tails, but in their heads, and the single tail is left outside the egg on fertilization, so that two-tailed sperm (one for the Grow and one for the Know) just won't hack it. What's more, it's antibodies, not antigens, that our immune systems generate against infectious organisms; and living things do not live on raw energy, not even thousand-cycle oscillating electrical current.

That last is a reference to the "chip-mold" Rucker's human chauvinists devise to attack the boppers. It is a fungus that seems to need no organic food to fuel its growth as it consumes the boppers' silicon chips. It also offers Rucker's world a compromise of some genius —even as it destroys the boppers, the chipmold forms a symbiotic structure with the "flickercladding" the boppers wear. The result is a free-form, distributed-processing artificial intelligence that humans can wear; it sinks tiny tendrils into the human brain for communication, not for control or usurpation.

War is not the answer, says Rucker. The options are not simply either-or. The future belongs to communication, cooperation, symbiosis.

It's a shame he couldn't say it without insulting the intelligence of anyone who understands a little biology.

Don Wismer has done some nice short work. His novels have tended to be for young adults.

Those two sentences, put side by side like that, sound like I am about to say that kids' stuff can't be nice, or ambitious, or lit'ry. And that, of course, just isn't so. But there is a large body of young people's fiction that is pretty conventional. In science fiction, we're talking space opera, simple characters, lots of whiz-bang, a smidgen of sex, more violence. What used to entertain adults in the 1930s (perhaps because nothing more mature was available in SF).

So. Yes. Wismer's **Planet of the Dead**, sequel to *Warrior Planet*, looks like conventional space opera, with young heroes and young villains. It's

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not labeled as being for kids, but it has the feel and, as I say, Wismer has written in that genre. Here's the scheme: A corps of martial-arts experts, the Bodyguard Guild, sends one of its men to a planet that seems to be dropping out of galactic society, perhaps due to a drug problem. The agent is killed, messily, by some form of mental attack. Now Asher Tye, the one Bodyguard with anything resembling mental skills, trained by a representative of the Sculptor subgalaxy (see *Warrior Planet*), must lead forth a team consisting of his wife Clemmy, a fellow named Dov who would be quite happy to make a little time with Clemmy, and three aliens. Ignore the book's cover, which shows one alien, two men, and two women fighting off a horde of zombies and weird blobs colored blue and magenta. The blobs are supposed to be ochre.

Blobs? Call 'em Ressies. They make people feel goooood! But they are incidental to a plot by failed apprentices (just kids, really) of the villainous wizards from *Warrior Planet*. They have enough mental power to affect the flow of electrons through wires, and hence the flows and patterns of information inside the master computer that coordinates the galaxy. Thus they mislead everyone into thinking the Bodyguards are the real villains, and Ressies don't exist, and strange aliens are not extinguishing whole species on the frontier. They must be stopped, and of course Asher Tye does the job.

What is the villains' goal? I failed to detect much beyond the wish to be left alone, to duck responsibility, and to congratulate each other on their genius and on how well they keep their Ressies under control. Wismer seems to have constructed a parable of the drug subculture, its hazards—drugs *eat* you, eventually—and the desirable alternative of embracing a life of commitment.

So. It isn't really just space opera, is it? It's a vicarious object lesson, complete with moral. Just what the little punks need.

Not to mention the big punks.

As you know from earlier reviews, I love Charles de Lint for his deft urban fantasies. I therefore eagerly anticipated his new book, **Wolf Moon**, whose hero, Kern, is a young werewolf who, fleeing persecution, meets a magical harper who tries to kill him. He escapes and comes to an inn, with whose mistress, Ainsy, he falls in love. He thinks that, just possibly, he may finally have found people who can accept him for what he is. But then comes the harper to reveal him for a beast, turn his friends against him, and begin the hunt again. Kern must recognize and confront the bewitching force of evil represented by the harper, cease to flee commitment, and embrace his fate if he is to find happiness.

Does it sound promising? I thought so, too. Unfortunately, the story fails to come to life. We never learn—beyond an inadequate suggestion—what happened to the tinker's wagon. The valley of the tale is weakly evoked. The fairy folk are an intrusion with which nothing is done. The characters are too few to be so unevenly portrayed, one or two more rounded, the rest simple cardboard, or so inconsistent in their roles (I think of Fion, the paper-cutout bawdy barmaid, far too slimly sketched to support the shift in her importance toward the story's end).

I suspect that de Lint is far more comfortable with his material when he bases it firmly in more modern settings. So are his readers, for they enjoy the freshness of urban fantasy when so much of

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what is on the bookstore shelves draws upon traditional and worked-out veins.

It's here again. A quarter of a million words of science fiction short stories and novelettes. Twenty-eight stories by Pat Murphy, Bruce McAllister, Bruce Sterling, Kate Wilhelm, Ursula K. Le Guin, Robert Silverberg, Octavia Butler, Howard Waldrop, Michael Flynn, Gene Wolfe, Orson Scott Card, Michael Bishop, and more. An essay that overviews the 1987 year. A long list of honorable mentions.

It's **The Year's Best Science Fiction: Fifth Annual Collection**, brought to you by that indefatigable editor, Gardner Dozois.

Something else that's here is the Wollheim **1988 World's Best SF**, but you won't want it unless you crave a smaller, pocket-sized, less expensive tome. Of Wollheim's ten picks, six appear in the Dozois; two of the rest are in Dozois's list of honorable mentions; the remaining two are "Second Going," by the late James Tiptree, Jr., and "All Fall Down," by Don Sakers (from this magazine).

Speaking of sources, how does Dozois stack up? Since he's the editor of another SF magazine, I've been paying attention to where he finds his bests and noting that though he seems to take many from his magazine, the other anthologists of bests are doing the same, thus validating his judgment. Does this remain true? Judge for yourself: His book contains eleven (out of 28) stories from *Asimov's*; that's 40 percent, folks. Of Wollheim's ten, five—50 percent—come from the same place (and four of them are in both books).

The original anthology market has been a mite peaked of late. Fortunately, some SF editors believe in the value of expanding the market for short fiction. Even more fortunately, some of them are in a position to do something about it, as when Bantam's Lou Aronica and Shawna McCarthy announced the annual **Full Spectrum**. It contains state-of-the-art fiction by state-of-the-art writers. Marvelous stuff. Stuff we'll see dominating the award ballots and the Best of the Year anthologies.

The first volume is now out. It contains 25 stories by Thomas M. Disch, Andrew Weiner, Gregory Benford, Jack McDevitt, Jack Massa, Charles Oberdorff, Elissa Malcohn, Robert Sampson, Jeffrey J. Mariotte, Steven Bryan Bieler, Howard V. Hendrix, Walton Simons, Nancy Kress, Kevin J. Anderson and Doug Beason, Ronnie Seagren, Lisa Goldstein, Lewis Shiner, Pat Murphy, Fred Bals, T. L. Parkinson, James Morrow, Aaron Schutz, Richard Grant, Michael Blumlein, and Norman Spinrad. If you find many of those names unfamiliar, well, several are first-time writers, and the editors are justifiably proud of their discovery. Most of the stories are reasonably competent, though they are not great enough to warrant the editors' continual, insistent breathlessness. The best story may be the boldest, Spinrad's novella, "Journals of the Plague Years"; it concerns an AIDS plague gone wild, resulting social madness, and the forces that resist a cure once it is found; the cure itself is gobbledygook, but the story is quite effective.

The worst is inarguably Bieler's "Tinker to Evers to Chance." The editors, by their admission, succumbed to a weakness for baseball stories. They ignored the serious defects, and I don't mean the ghost who makes it work as well as it does. The problem is that Bieler set his tale partly in Maine, but totally blew his descriptions and thus

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totally ruined his credibility with anyone who knows the state or is willing to take a moment to check an atlas. There is a town of Troy in the state, but it is neither in southern Maine nor on the coast. And there is no Mansfield County.

Did you think there were enough books on writing—much less on writing science fiction—around? You're right, of course. It's all been said, by masters of the craft, by critics, by teachers, and there is nothing new to add, nor will there be until someone, someday, really figures out how to teach writing. So far, about all anyone can do is urge the tyros to write, write, and write some more, inform them about a few of the basics of story structure and about what sorts of manuscript paper and print color the editors expect, and ladle out the encouragement.

So what are the galleys of Christopher Evans's **Writing Science Fiction** doing in my mailbox? He adds nothing beyond the unique insight (which may be due to a typo) on page four of the introduction: "No amount of talent can substitute for the hard graft that is also necessary to become a writer." Aha! Now I know why I have never made the bestseller list, and why no one (not even bookstores!) has been able to get a copy of Larry Janifer's book (*Knave and the Game*, Doubleday)—we haven't bribed the right people!

Seriously, the book is interesting, if not for its content, then for why Evans (an erstwhile magazine editor and author of a 1982 Ace SF novel) wrote it. He says: "Writing a book of this nature is an act of hubris: it is far easier to preach the principles of good writing than to practice them yourself. To me, this book was largely an exercise in confronting many of my own limitations as a writer of science fiction and of suggesting to myself ways in which I might overcome them." He does the job well, and he therefore offers other less-than-famous writers a concise, thoughtful basis for reflection. At the same time, he also offers would-be writers a lesson that, because of its brevity, is somewhat less expensive than many other books that say much the same things.

I am not about to call Piers Anthony Dillingham Jacob names. First, I don't know him well enough to do so. Second, I don't want to, for I have greatly enjoyed more than one of his novels. Third, he does a more than adequate job of calling himself names in his autobiography to age 50, **Bio of an Ogre**.

The book is intriguing both for the tale Anthony tells and for the ancillary materials he includes. These items include an essay by his mother on the role of the Jacob family, as Quakers, in Revolutionary Spain in the late 1930s; an essay by his father on reclaiming a Vermont farm; an early, unpublished short story; and an essay on his days as a student teacher, together with the awful story one of his students sent to an SF magazine under his name.

By his own account, Anthony is a hard fellow to get along with. He's a man of stern and uncompromising principles, of painful and abrasive honesty, of long-lasting grudges, more forgiving of himself than of others, quick to leap to the conclusion that someone is stepping on his or his family's toes, and then to call the bastard out. Read the book, and you will see that it all comes from an unstable childhood, learning problems, victimization by bullies, and an ingenuousness that cannot be shaken by the nature of reality. To him, right and wrong are black and white, a contract means what he thinks it should mean, and he hesitates not a moment

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to enrage his editors, critics, fellow writers, and neighbors.

It seems obvious that, but for his inability to compromise, he might have become a famous, wealthy writer much sooner in his career. If only someone with the acumen of a Christopher Evans had taken him in hand as a youth and told him who to bribe, or that bribes —compromises, perhaps—can ease the writer's, or anyone's, way.[2]

Actually, I sympathize with him. It is very easy to get mad at the idiocies of others. It is harder to remember that they just as easily grow furious with our idiocies, and then to seek some middle ground of mutual semi-idiocy. Few do this, preferring to find some group of Republicrats or Commialists or christiammedans with whom they may share idiocies. Very few define a group with only one or two members, but this seems to be what Piers Anthony has done. Sadly, however fine his writing or just his stance, this means that in society's eyes he treads the fine line between being called an eccentric and a crank.

May he never cross that line.

ANADEMS

Just received: Orson Scott Card's **Saints**, TOR, $4.95, 713 pp. I don't think I'm about to review it, for it is neither SF nor fantasy, historical novels aren't generally my cup of tea, and it is so long that reading it, much less reviewing it properly, would preempt too much of less peripheral interest. But it's by Card. So take note. And if historicals are among your interests, watch for it. It concerns the life of one Dinah Kirkham and its intersection with the Mormons of Card's own background. A quick flip through the pages—the sort of treatment you might give the book if you spotted it in a bookstore—suggests a very satisfying wealth of event with plenty of high drama and lots of juice. ■

[2] Dammit, Piers! Before you blow your top at me, read the preceding review. I'm making a joke!

●Have you heard about the scientist who worked with space problems so long his head was full of it?

Howard Johnson

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brass tacks

Dear Stan,

As one popularizer of mathematics, may I rush (where angels fear to tread . . .) to the defense of another?

L. Sprague De Camp (Brass Tacks, May '88, and let me say at once that I've always admired his stories) thinks Margaret Silbar made a boo-boo when she said that the number of relationships between pairs of objects can be described as "rising as the square." Correctly, he points out that the number is $n(n-1)/2$, not n^2.

But.

There are two levels to all this. The pedantic details don't matter, but maybe the general principles involved are worth rehearsing.

1. Popularizers of science are required, by the nature of the job, to *simplify* things. Criticisms about points of fine detail ignore this at their peril. Margaret's point was about the rough order of magnitude of the growth-rate. The square is a good approximation. It's easier to say than $n(n-1)/2$, and it conveys the general size well without making too much fuss. One of the rules of the popular math trade is *keep formulas out*. Editors always ask for it, readers tend to turn off if it's violated.
2. I've kept up my sleeve, until now, that what Margaret said is—in one entirely neutral interpretation—perfectly correct. Mathematics is, among other things, the art of selective suppression of detail. How to see the wood for the trees. If Margaret had meant that the number was *equal* to the square, I suspect she'd have said so. So when she said it's "rising as" the square I'd guess she meant something else.

It's a good bet she meant—if I'm allowed to speak jargon—that the number of ways to pair off n objects, call it p(n), is *of the same order of growth* as the function n^2. The technical definition is that there should exist two positive constants k and K such that $kn^2 < p(n) < Kn^2$. (For this case, take $k = 1/2$ and $K = 1$.)

If you prefer, I'm saying you should replace n^2 by $\frac{1}{2}n^2$. It's still not *right*, but the percentage error gets very small as n gets very large.

The idea of orders of growth is crucial to whole areas of math. One is number theory. Another is computer science, where people want an estimate on how rapidly the time needed to compute something grows ("complexity theory"). Workers in the field often *say* "increases like"—not a million parsecs from "rising as"—over coffee, even if it doesn't get into the professional journals. The point is that *you don't want to think about the details*. The *approximate* growth rate is more useful, because it's easy to work with.

IAN STEWART

Dear Dr. Schmidt,

Re: Frame of reference failure with Stephen Kraus's story "Frame of Reference" (May '88); we have had our fun with Bible-thumper bashing, pulled a neat sleight of hand—and used clay pigeons because they are easier to hit.

The author is simultaneously portray-

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ing his straw-figure Christians as sufficiently naive to be ignorant of a basic Christian idea, and yet sufficiently sophisticated to quickly accept a counter-intuitive result of a physical theory new at the time of the story.

Perhaps Stephen Kraus's background is so thoroughly materialistic that he has never been exposed to (or thought it necessary to research for his story) the notion of spirit. He should be aware, however, that real-world Christians do not believe in a physically localized God who would therefore need to move from place to place in the act of creation. He may wish to look up "omnipresence," if he has access to any literature on Christian thought.

Kraus presents his Christians as ignorant of their own religious tradition, yet surprisingly sophisticated in physical theory—willing to go against a long western tradition (including Isaac Newton) of absolute time to accept the time dilation predictions of a theory then not twenty years old, one that had had only recent experimental support (remember: one never proves a scientific theory, one only disproves).

I admit to being Christian (most will allow that title to Catholics); I hope that a doctorate in physical theoretical chemistry from the University of Chicago gives me credentials as a scientist. Both as a Christian and as a scientist, I find stories like "Frame of Reference" distasteful.

As a Christian and as a scientist I find that I must believe several impossible things before breakfast. Those who think that atheistic scientists are not acting on faith need only look at the fervor of their search for the missing mass (so as to have a cyclic universe and not the embarrassment of a unique beginning in the Big Bang).

TIMOTHY ROLFE

Minneapolis, MN

The author replies . . .

My target in "Frame of Reference" was creationism, not Christianity. That's the subject that ruins *my* breakfast.

STEPHEN KRAUS

Dear Dr. Schmidt:

I found Michael F. Flynn's "Introduction to Psychohistory" both enjoyable and stimulating. Actually, it stimulated far too many comments to go in a letter, though if Michael Flynn is ever in this neighborhood I have some Fürstenburgerbräu in the refrigerator to facilitate the discussion. A few things I'd like to say just on the topic of war and peace:

There was an arms race that did not end in a war; indeed it ended in what was probably the most successful round of disarmament negotiations in history. This was the naval arms race in the period just after World War I, which came to a halt in the mid-1920s after a series of international accords limiting the number, tonnage, and armament of ships each major naval power could own or build. The reason it worked was that the two leading naval powers, Britain and the U.S., had no real quarrel with each other, and the leadership of the other competitors (notably Japan) was pragmatic enough to realize there was no hope of catching up with the Big Two. As a result of these treaties, most of the battleships in the world were scrapped and plans to build more were severely curtailed, leaving each of the two biggest navies with fifteen, and the smaller ones with a limit of nine each. (Since the battleship was the decisive weapon at sea, it seemed only fair to the Big Two to let the Japanese build the same quota of auxiliary types such as aircraft carriers.) The accords worked out for about a decade, until more rad-

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ical elements took over in several countries and started a new arms race that did end in a war, which (in naval terms) the Big Two won overwhelmingly. The negative aspect of this was that it contributed to the British policy of putting far too much trust in negotiations with the likes of Hitler. I conclude that such negotiations can work if all parties are acting in good faith, if they are hard-nosed about it, and if new technology does not upset the assumptions on which they are based—three rather large "if's."

More generally, I think there are factors at work that make it unlikely that the westernized industrial countries will go on the warpath again the way they did in past centuries. One is the general rise in the standard of living. In the Good Old Days, when most people lived rather short lives as dirt farmers or workers in labor-intensive industries, the life of a soldier had some real attractions: food, clothing, shelter, promises of regular pay that were often fulfilled, the chance to plunder civilians, etc. Now, on the other hand—well, most of us remember how eager a lot of American youths (including this one) were to go to Viet Nam, and it's no different in the other westernized countries.

Another factor is working in the same direction. Over the last century or so, war has been getting more expensive and the things that can happen if you lose have been getting worse. Simultaneously, the possibility of a good return on capital investment at home has increased. At one time war was a good investment; the most effective way for the ruling class of a country to increase its power and wealth was to conquer more territory and more people. Now, from the standpoint of a western country, it's a terrible gamble with little prospect of return. Any territory gained is likely to be inhabited by a population that is either unproductive or actively hostile. Development at home is a much better bet. Accordingly, the western countries have allowed their spheres of political and military influence to shrink, eliminating unprofitable dependencies. Since 1945 this has been true of every one of them, including the U.S. (After all, Korea and Viet Nam were defensive wars.) This is fine and would be finer except that a number of non-western countries currently have the technology to make trouble but are still at a social and economic stage where they see aggression as desirable. The USSR may be outgrowing this phase at last—time will tell. Other countries that are at this stage would include Argentina, Iran, Iraq, and Libya.

As the realization has spread in the westernized nations that aggression is unprofitable, the conviction has grown (or the meme has spread) that it is immoral as well. Seventy-five years ago, imperialism was thought to be a normal healthy way for nations to behave and war was considered a glorious adventure. Then the leaders of western society staunchly defended militarism and colonialism on moral grounds; now their great-grandchildren loudly denounce them, also on moral grounds. Perhaps people are more moral now than they were back then—but a cynic might tend to be just a bit suspicious of anyone who asserts such a close correspondence between morality and his own self-interest.

STEPHEN C. FISHER
Philadelphia, PA

Dear Stan:

Harry Stine's Alternate View article in the June ish seemed a bit off the wall. (After giving him kudos in my article I can berate him in a letter!) If Mr. Stine

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wants to plug Hoagland's book, that's fine, but the tone of the column is all wrong. For one thing, his assertion about the *Viking* photos, that "most of them [have been] ignored and even hidden from public view for over a decade," is just not true. (If nothing else, they're available from NASA at cost; I have my 1983 copy of the "National Space Science Data Center" catalog right here.) He also is gratuitously insulting when he accuses the planetary science community of not doing what they "should have been doing since 1976; careful analyses of photographs from the *Viking* Orbiters." This amazing statement merely suggests a lack of familiarity with the literature.

(By the way, Mr. Stine keeps referring to "planetary astronomers," and maybe that's why he's missed so much of the *Viking* literature. Virtually all the planetary work these days is being done by planetary *geologists*, and most of that work shows up in the earth-science journals, not in the astronomical journals. Far more about Mars now shows up in *Earth and Planetary Science Letters*, *Bulletin of the Geological Society of America*, and *Journal of Geophysical Research* than in the *Astronomical Journal*. If Stine is serious about Mars researches, he should check the "Bibliography and Index of Geology," put out by the American Geological Institute.)

To illustrate: A couple of summers ago I ran into Tom Watters, a geologist at the Smithsonian, out here in the Columbia Basin who had DOE money to study structures in Columbia River Basalts. Although the DOE money was specifically in support of studies related to the (now canceled) nuclear waste repository at Hanford, Watters is interested in these structures as analogs of ridges seen on Mars (presumably in detailed *Viking* photos!)

These accusations are especially ironic since a number of the Martian geologists (!) are working there in Arizona, right down the road from Stine's home. Mike Malin at ASU, in Tempe, has done a lot of work on Martian channel development by comparing *Viking* photos with studies of canyon development in the southwest. He is currently working in Iceland, using peculiar sub-ice volcanic landforms there as possible analogs of Martian outflow channels with the landforms left by the Spokane glacial floods up here in Washington. A contingent at USGS Flagstaff has been working on Mars geology for a long time—for example, Barb Lucchita, one of the scientists there, has recently documented what appear to be glacial features on Mars (Lucchita, 1982) and also permafrost features (Lucchita, 1983). This again suggests studying detail!

Mr. Stine's accusations against "scientific Brahmins" who won't listen to amateurs 'cause they have grants to defend, is also not borne out by a recent experience of mine. At the December meeting of the American Geophysical Union, I heard a talk by Chris Russell, a UCLA radio astronomer, in which he described a program to study the oft-reported "ashen light" of Venus. Interested amateur astronomers are to observe Venus, seeking the ashen light, and their observations will be correlated with ongoing radio data from the still-flying *Pioneer Venus* orbiter. The hope is to (a) see if the ashen light really exists; and (b) if so, is it lightning, aurorae, or what? At least Dr. Russell cannot be accused of "Brahminism"!

(By the way, the only thing "strange" about the postponing of the *Mars Observer* is that it hasn't been postponed more. Is Stine *really* unaware of the funding difficulties the planetary probes have had? Stine is also an old enough

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hand in the writing game to realize that the only "suppression" bookstores exercise is of books they don't think will sell. The "scientific establishment" certainly has no veto power over the mass-marketing of books, as should be obvious. Quite the opposite, in fact; a book is much more likely to sell well if it attacks "closed-minded scientists," etc., etc.!)

Mr. Stine has indulged in this sort of tirade before—I remember his assertions in an Alternate View a while back that "nothing contradicting Einstein could be published," to which some physicists responded by noting that he evidently hasn't been reading the literature. Now, maybe Mr. Stine is trying to get a rise out of people—treading on *my* toes, as it were. But this sort of misrepresentation is getting beyond the role of a debating device to approach intellectual dishonesty. It certainly does *not* enhance the credibility of the cause he is espousing.

STEVE GILLETT

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To the Editors:

I am writing in response to G. Harry Stine's "Mars: Crisis in Exploration" in your June issue.

As the manager of a book store belonging to "one of those chains," I was incensed to read that I was "preselecting the books my customers should read" by not carrying the book *Monuments of Mars* by Richard C. Hoagland. Consistent with my policy, I have had *Monuments of Mars* on the shelf for no less than six months, ever since a customer requested it.

I am tired of the slurs bookstores receive at the hands of writers like Mr. Stine, who make ridiculous generalizations about the intelligence and integrity of bookstore personnel. I would no more indulge in censorship than I would presume to pre-judge the validity of the book's claims. Our business is to sell books, not to ban them. Our customers are capable of making their own judgments concerning a book's content.

The fact that I will continue to sell Mr. Stine's books, even though he has proven himself to be uninformed and hasty in his judgment of the book retail business, should amply prove my point.

CATHERINE DAGES

Costa Mesa, CA

Dear Stan,

Can I call on your readership for help? I am trying to find references in science fiction stories to high-temperature superconductors. More specifically, I am trying to find the *earliest* story that mentions such an idea. Perhaps someone with a long memory of a big stack of back issues of *Analog* and other SF magazines can point me in the right direction.

CHARLES SHEFFIELD ■

●Ten million "black holes" may exist in our galaxy itself.

John Wilhelm

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● It's important to keep an open mind, but not so open that your brains fall out.

Stephen A. Kallis, Jr.

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a calendar of analog upcoming events

13-15 January 1989
ESOTERICON 6 (NYC-area fantasy and occult oriented conference) at Holiday Inn Jetport, Elizabeth, N.J. Info: Esotericon 6, Box 22775, Newark, NJ 07101. (201) 743-7674/672-9244.

15-19 January 1989
General meeting of the American Physical Society jointly with the A.A.A.S. at San Francisco, Calif. Info: A.P.S., 335 East 45th Street, New York, NY 10017.

20-22 January 1989
ICON 13 (Iowa SF conference) at Roadway Inn, Coralville, Iowa. Registration—$15 until 1 January, $18 at the door. Info: ICon 13, Box 525, Iowa City IA 52244-0525.

20-22 January 1989
CONFUSION 102 (Ann Arbor area SF conference) at Ann Arbor, Mich. Info: AASFA, Box 8284, Ann Arbor MI148107. sk 20-22 January 1989 ICON 13 (Iowa SF confereence) at Roadway Inn, Coralville, Ia. Registration—$15 Until 1 January, $18 at the door. Info: ICon 13, Box 525, Iowa City IA 52244-0525.

21-22 January 1989
CONFURENCE ZERO at Red Lion Inn, Costa Mesa, Calif. Registration—$10. Info: Confurence, Box 1958, Garden Grove CA 92644-1958.

27-29 January 1989
BOSKONE XXVI (New England SF conference) at the Marriott & Sheraton Tara, Springfield, Mass. Guest of Honor—Tim Powers, Official Artist—James Gurney, Special Guest—Tom Whitmore. Registration—$25 until 15 December 1988, $40 at the door. Info: Boskone XXVI, Box G. MIT Branch Post Office, Cambridge MA 02139-0910. (617) 625-2311.

31 August-4 September 1989
NOREASCON III (47th World Science Fiction Convention) at Sheraton-Boston Hotel & Hynes Convention Center, Boston, Mass. Guests of Honor—Andre Norton, Ian & Betty Ballantine; Fan Guest of Honor—The Stranger Club (Boston's first SF club). Registration—$60 (adult), $40 (child) to 15 September 1988; $70 (adult), $45 (child) to 15 March 1989; $80 (adult) $50 (child) to 15 July 1989. Supporting—$20 at all times. No advance memberships after 15 July 1989. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Noreascon III, Box 46, MIT Branch, Cambridge, MA 02139.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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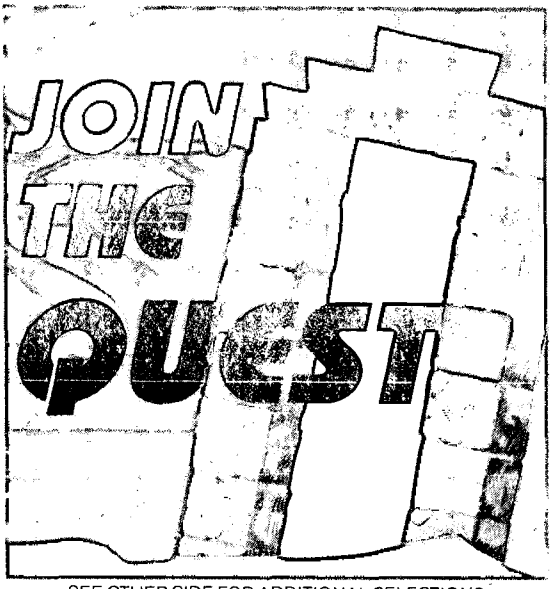

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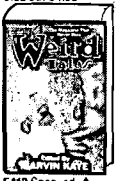

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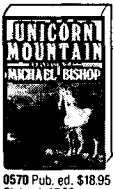

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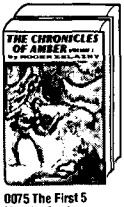

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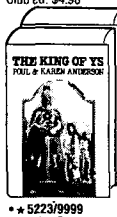

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